Textbook of Nursing Science

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Foreword

Contents

1. A Historical Overview of Nursing

BY PH.D. JÓZSEF BETLEHEM, PH.D. ANDRÁS OLÁH

In the present chapter we have attempted to give a summary of historical antecedents of nursing interpreted within up-to-date conceptual frameworks. The aim of this chapter is to familiarize the reader with the main highlights and significant societal factors leading to nursing becoming an independent profession, both on international and national level. In order to learn about the conceptual frameworks of modern nursing it is essential to review major organizations and movements which dealt with nursing activity, nurses and their training as well as with enforcement of their professional interests. What is covered by this is not a chronologically detailed list but rather social processes lobbying for the profession.

The formation of the social role of nursing

There are several elements of discussion in relation to the journey of Nursing becoming a profession Numerous tasks performed for people in need have been rated as nursing in a broad sense. Most often these tasks included providing for sick people, keeping their environment clean and tidy, satisfying the basic needs of sick people, and in the case of more qualified staff they included helping and assisting the interventions done by physicians (surgeons). Originally, care for the poor and the needy belonged to the fraternity. According to the most accepted approach, on the basis of activities of nurses and carers it is useful to differentiate:

- organizations of the church, denominations (orders),
- secular (civil) organizations and
- nursing created and operated by military corps.

In terms of social roles, nursing activity was partly carried out voluntarily and in certain frameworks (state, local authorities, local governments, private individuals, associations) for payment, which was a basic condition for it becoming a vocation as it provided a living for those practising the vocation. In addition to all this, professional skills, conscientiousness, shaping of ethical norms had an influence on the autonomy of nursing, and its achieved prestige. (Kozon et al, 2010; Seidl, 1999).

Main international highlights of nursing

Although major stages in the development of the nursing vocational group (obstetrics, nursing, care) can be seen in early historical periods, the most significant happenings which influenced the fundamentals of the modern profession can be traced back to the Modern Age. Healing existed in earlier times and accompanying nursing could be observed as well, but it was never discussed separately. Thus, in our review of the vocational group, this will be regarded as the starting point.

In the Middle Ages religion and medicine were closely related, that is why it can be understood that the first hospitals were organized around churches. Many times patients also prayed for healing at the holy places, they were accompanied by their relatives who frequently carried out actual nursing tasks for the sick. However, by this time there were already a lot of practical observations and medicinal knowledge available for healers about diseases and injuries. Provisions for the poor and the sick were organized around hospitals in Europe, which, through this, marked a social group having special needs as well.

The persons who worked in Christian hospitals organized around churches were called deaconesses, who many times were unmarried ladies or widows. Serving the community was their main job.. In times of war, tending to casualties fell upon people living near to the battlefields, though soldiers were taught to be able to dress a wound themselves during their military training in most armies. However, care was superficial in many cases, and limited by lack of hygiene.. Lack of application of professional rules served as basis for the outbreak of many epidemics .

Philanthropic love was the main tenet of religious orders, which was followed by monks and through their work they fulfilled a useful role in caring for the needy. Their appearence also expressed their role fulfilled in society. Both female (e.g. Saint Elizabeth, Saint Catherine, Grey Sisters, Black Sisters) and male (e.g. Saint Anthony, Saint John) religious orders carried out caring and nursing tasks with the sick. This separation was also important because sick people could only be cared for by a carer of the same gender. In spite of this, there were hospi-

tals where denominations could perform this work together (e.g. Sisters and brothers of Mercy, Charity). The quality in most well-functioning hospitals of religious orders fell significantly when the founder of the order died and direction was taken over by others.

In way of summary, it can be stated that from the middle of the 17th century (after the Thirty Years' War in Europe) to the beginning of the 19th century, Nursing greatly deteriorated in professional terms (Jacobsohn, 1898). According to Nutting and Dock, nursing went through its darkest period at this time. The causes of this can be found on one hand in the fact that infrastructure was deficient, and on the other hand the staff wereunskilled and were of low status. Naturally, this determined the fundamental mortality of patients (Nutting & Dock, 1907). At that time neither the authorities nor the physicians themselves paid due attention to the improvement of patient care conditions, or to facilitating patient comfort. Hospitals were rather like prisons, with bare, unpainted walls, small dark rooms where no sunlight came in. There were no traces of flower gardens or friendly interiors that could be found in and around monasteries. The professional content of nursing was mostly preserved by different religious congregations, however the signs of decline in professionally high standards were clearly present here as well (Jacobsohn, 1898). The idea of changing the architectural form of hospitals was brought into focus by the end of the 19th century, as a result of which 3300 hospitals were built in the German Empire between 1876 and 1898, which was a natural follow-up on population growth as well.

Nursing in the Middle Ageshad no professional context , since the people who performed it were despised by society. Abuses were frequent in hospitals, depicted in writings by Nolan (Nolan, 1789). Nolan described nurses as heartless, thoughtless, careless, neglectful. Though managers were aware of this, it only meant a measure for show when an official asked discharged patients before leaving the hospital what complaints they had in connection with the behaviour of the nurses. Of course, patients were glad to be able to leave the hospital and did not wishcomplain. Yet if someone attempted to do this, giving proof was already almost impossible, since the patient had to leave the hospital. Nolan himself urged to change the situation substantially.

Industrialization was fundamental to the most significant social changes in the 19th century, which required social provision as well By the Middle Ages it became more evident that there was a connection between poor social circumstances and the spread of diseases, which was accelerated by the formation of a modern civilized society and population growth. That is, healthcare and social issues became less and less separable, and managing them became anofficial task for Society. The development of Nursing became an important part of the solution to the effective promotion of good public health.

Europe

France

In Modern Age hospital development, patient care aquired a crucial role. These institutions were mainly built outside towns, mostly a chapel was connected to the building, for the express purpose of nursing and curing the sick. Men and women were placed in separate wards. At that time wards were crowded, many times several people lay in one bed. Epidemics and infections were frequent because of poorhygiene, and poor staff training.

The history of hospital development in the Middle Ages goes back to France. The two oldest but still functioning hospital buidings were built in Lyons (542) and Paris (650) (Hôtel Dieu Lyons, Paris) fulfilling the role of poorhouse as well. Those who worked in these institutions were not professed nuns but religious women who devoted their life to this. They did not wear a special uniform either. Hôtel-Dieu, Tonnerre (1293) was founded by Marguerite de Bourgogne in Tonnerre, it was the first hospital-type building (Hôpital des Fontenilles). It had the capacity to care for 40 patinets in its largest ward.

The hospital Hôtel-Dieu, Beaune (1443) was founded in Beaune in 1443, having been reconstructed several times it functioned as a hospital until 1971. A nursing home and a nursing museum can be found there today. After the Hundred Years'War people suffered from poverty in France as well. Many were threatened by starvation. In the midst of wartime riots, three quarters of the population in the small town of Beaune were on the edge of dying of hunger. Chancellor of Burgundy Nicolas Rolin and his wife Guigone de Salins decided, for their salvation, to found a hospital with a chapel in the town to provide for poor sick people. Actual patient care started on 1 January 1452.

Hôtel-Dieu, Chatillon les Dombes (1617) – Vinzenz von Paul and Louise de Marillac founded the hospital which was operated by a Christian women's association and later recognized by the Pope as a religious order. This union was the first model of charity organizations in the Modern Age. De Marillac (Mother Le Gras, superioress of the religious order) managed taking on nurses, who later were named "Grey Nuns" (Sisters of Charity of St Vincent de Paul Society). The society is the largest Christian female community of the Catholic Church in the world today with a membership of more than 20,000.

Austria

The first Central European hospital was founded by Emperor Joseph II in Vienna in 1784 (Allgemeines Krankenhaus), which exists up to this day. By the reconstruction of the earlier poorhouse an institute with 2000 beds was created to which parks and yards are connected. In the hospital there were 111 wards with an average of 20 patients each (Walter, 2003). This was a great step forward as in Paris there were still 3 to 4 patients

in one bed at that time, whereas here every patient had their own bed. There were four internal medicine, two surgical, one venereal diseases departments functioning, where 140 overseers were working. It was the overseers' task to heat and air the wards, hand out medicines, feed the patients and make the beds. Overseers lived in the hospitals together with the patients, and they came from the lower classes of the population. Director of AKH Theodor Helm started making the nursing profession feminine as earlier mostly men worked in this field. Theodor Billroth started the secular nursing school in Vienna in 1879 (Rudolphinerhaus), where they primarily wanted to train assistants of physicians from the circle of commoner females. The practice-oriented training took three years, at the end of which nurses received a diploma. By the mid 1800s so few nurses worked in AKH that nurses of denominations were also employed, which led to severe conflicts. Courses for inspectors were started with 200 participants in 1899. In 1904 a nursing institute was set up in AKH following the model of Rudolphinerhaus where nurses in a blue uniform were trained in two years. A nursing scool was created by the Ministry of Home Affairs 30 years after the Rudolphinerhaus. There were 8 nursing schools functioning in Austria in 1930. In 1938 the names 'trained nurse' and 'nurse' ceased to exist after the aggressive occupation of the country by Nazi Germany. After German law amendments had been applied, uniform Red Cross training was introduced through which the length of training was reduced from two years to one and a half years, and it primarily prepared for practice. Women were called sick-care sisters, men were called sick-care nurses. These special names in this form were in official use until 1997. This title of nurse sometimes caused a problem for qualified (trained) male nursing staff because the general public still identified the word 'nurse' with a lack of education. A change in law was introduced in professional terminology in 1997, when the names 'qualified health-care and sick-care nursing sister' and 'qualified health-care and sick-care nurse' were introduced accentuating by this the task of nurses in the prevention of illnesses and health education. According to the act, the purpose of the occupation is literally „the elevated service of health care and sick care" (Walter, 2003).

Germany

Theodor and Friederike Fliedner (1836) founded the Deaconess Motherhouse in Kaiserswerth, which also served as basis for the nursing school. Their main aim was to alleviate the social consequences of industrialization, to provide for prisoners, to educate and teach children, to care for the elderly and the sick.

The rules of life in the Deaconess Motherhouse were summarized by Fliedner in the following way.

"…The institute is a free religious organization, which is independent of the state and church prefects. …" They avoided two mistakes: profession in the order or contemplating ascetic comportment and decentralization. Deaconesses of Kaiserswerth could freely leave for home or marry after five years of service. The motherhouse is a democratic family, where deaconesses can choose their superiors or principals.The motherhouse provides protection and home for every member. It retains the right of final decision and revocation over their members against external organizations. The institute functions in four fields:

A, Nursing
- hospital care (acute, chronic, special)
- care
- district (parish) care

B, Care for the poor
- orphanages
- the elderly and ailing
- sewing and needle-craft
- poorhouses
- asylum for the disabled e.g. the blind
- servants' rooms

C, Care for children
- schools for young children
- girls' schools
- teacher training schools
- vocational schools
- special schools (for the disabled, e.g.: the blind)

D, Help for distressed women - prisons
- convert prostitutes

The predecessor of the German Nursing Professionals Organsiation (Deutsche Berufsverband für Pflegeberufe) of today was the German Sick-Care Sisters Professional Association founded by Agnes Karll (1903).

The regulations to take state nursing exams were first introduced in 1906, however the individual provinces joined this system at different times until 1924.

Switzerland

The first Red Cross nursing school in Switzerland opened in Lindenhof Bern in 1899. The International Council of Nurses was established in the same year with the participation of Great Britain, the United States of America and Germany. At present there are 135 representative members of the council, whose headquarters is in Geneva. Since its foundation, the aim of the organization has been to create a world platform for nursing organizations where they speak out in order to advance the social and economic status of nurses, to develop a worldwide nursing profession, and to influence national and international health policies. The uniform principles of nursing training were laid down in Bern in 1925.

The United Kingdom

The Royal College of Nursing was set up in 1916. The Parliamentary Act on Nursing was passed in the UK in 1919, which ordered state registration for nurses. However it only came into force from 1923. Before that, state registration obligation for nurses was introduced in New Zealand for the first time in the world in 1902. Activities of Florence Nightingale are described in detail in other works.

America (Canada, the United States)

Hôtel-Dieu, Montreal (1645) the first hospital of North America was established by Jeanne Mance, a French settler in Montreal. Mary Agnes Slively was the first to receive a nursing diploma according to Florence Nightingale's teaching program, and she was also the first principal of Toronto General Hospital's School of Nursing.

One of the most determinant examples of overseas private hospitals was the opening of Mayo Clinic in Rochester (USA), which was called St Mary Hospital at that time. Its characteristic feature was that from the beginning they paid attention to scientific achievements of the era, observing asepsis, antisepsis and independent anaesthesia.

In 1836 the Nursing Society of Philadelphia was created by secular nurses in Philadelphia. The society opened its nursing school in 1850. During the American Civil War (1861-1865) in addition to field physicians, nurses who constituted the nursing corps of the American Army also provided care for the injured in an organized form. Training has been in place since 1872 in the USA, where the first nursing diploma was issued in 1873 for Linda Richard (New England Hospital for Women and Children Training School for Nurses). Richard has since been regarded officially as America's first professionally trained nurse. Following this, another nursing school was established in Bellevue Hospital (New York City) according to Florence Nightingale's principles (1873). The first African-American nurse (Mary Eliza Mahoney) graduated from New England Hospital Nursing School in 1879.

The Red Cross movement was also a serious milestone in American history. As in Hungary it was founded in 1881 by Clara Barton, who gained a lot of experience in caring for the injured and organizing provision for them during the American Civil War. However, it took a long time for her to achieve her aim, as she worked on the project since 1873. However, the official nursing service of the American Red Cross was established only in 1909.

The first American professional journal entitled "The Nightingale" was published in 1886, which was followed in 1888 by a monthly periodical bearing the name of The Trained Nurse (Buffalo, USA).

Lillian Wald introduced the concept of community "visiting nurse" by holding home nursing courses after she had experienced the miserable circumstances and awful care of children in migrant community poorhouses of New York. After that she provided community nursing activity for the district. She was also the first to use the term public health nurse in 1893. She is regarded to be the founder of community nursing in Canada and the United States. She also contributed to the creation of Columbia University Nursing School.

The American Nurses Association was founded in 1911, which as a professional organization is dedicated to represent the interest of the nursing profession and lobby for them. Nurses Associated Alumnae, a predecessor professional organization which was a lobbying association of nurses, already existed in 1896 and its spirit was kept on by ANA. At present ANA represents 54 member associations on federal level, thus it takes part in shaping the practical standards of nursing, representing the rights of nurses on the labour market, improving their economic and living conditions.

ANA operates three member institutes:

- American Academy of Nursing
- American Nurses Foundation
- American Nurses Credentialing Center

The first economically and organizationally independent nursing school which followed university requirements was created at Yale University (Yale School of Nursing) supported by the Rockefeller Foundation in 1923. The training reflected the educational requirements of the curriculum rather than meeting classic hospital practice needs. Education, research and clinical practice still determine the school philosophy today. Though it had been possible to have a university degree in nursing since 1934, the new-type MSc program in nursing science was introduced in 1956. They were pioneers in introducing the qualifications for nurse practitioner and clinical nurse specialist. A PhD program in nursing was first introduced at Pittsburgh University in 1954.

Asia

Japan

The notion of nursing ("Kangofu") was first mentioned in Japan in 1876, and the first nursing school in Japan opened, thanks to Linda Richards, in 1885. In 1899 midwifery was recognized as an independent occupation recognized by the state and registration was introduced. Registration for nurses became compulsory in 1915. The Japanese Nurses Association was created in 1929, and ICN admitted them as members in 1933. The legal status of the nursing vocational group (maternity nurse, community nurse, nurse) was reregulated after World War II in 1948. In this their task was defined as quality improvement of community nursing, maternity nursing and nursing, enhancement of medical care, and improvement of public health. The vocations connected to nursing are still divided on this basis, which was supplemented with the qualification of nursing assistant in 1951. The first higher education (university) level education in nursing was introduced in 1952 and it lasted four years. The nursing training system was reregulated in 1987, in which principles of graduate and postgraduate education were determined. At present there is three-year special training and four-year BSc training for nurses as well.

Hungary

Beginnings of domestic organization

Nursing as a vocation gained ground earlier in Europe than in Hungary. The formation of domestic nursing in organized frameworks is partially linked to the development of the domestic hospital system, and partially to the needs that arose as a result of population growth. There were 92 hospitals before 1848 in the territory of Hungary, out of which 53 were founded after 1800 (Grósz, 1869).

There were some traces of nursing in Hungary around the end of the 1700s beginning of 1800, howeverthere was no evidence of any formal training being implemented at this time.. Parallel to physician training, domestic physicians started to recognize that it was necessary to train assistant staff as well. According to records, it was Ferenc Bene who started training people who performed nursing in Rókus Hospital. In 1835 in a proposal linked to Pál Bugát it was urged to set up a nursing school in addition to medical university, however it may not have been very effective.

János Balassa and Gusztáv Gaál raised again the idea of setting up an institute providing one-year nursing training in 1849 during the Revolution and War of Independence of 1848-1849. The adversities they experienced because of their role in the fight for freedom made it impossible to implement the plan to set up a school that was initiated by them (Kapronczay, 2002). After the Compromise with the Habsburgs in 1867, the development of domestic healthcare gathered new momentum the main aims being to prevent epidemics and to improve domestic medical training. The ideas to have a uniform system of nursing training were raised now and again but they remained on the level of private initiatives and implementations. A few physicians organized courses in some hospitals that lasted less than half a year primarily to help their own work. Church nurses also worked at that time, however they were not allowed to perform their activities in secular hospitals and sanatoriums in the territory of the Austro-Hungarian Monarchy until 1854 (Antall & Kapronczay, 1989). The Deaconesses of the Protestant Church first appeared in Bethesda Hospital in Hungary. The first nurses came to Hungary from the Deaconess School of Theodor Fliedner, which meant the first breakthrough in approach and practice in nursing training in Kaiserswerth in 1836.

The Blue Cross Martha Nursing Association was founded by Margit Trugly in 1926 as a Hungarian nursing congregation. It targeted training nurses, ensuring a home and representation of interests for them. Girls aged 18-36 and widows who did not have children were admitted to the order after a two-year probation. Nursing training took two years, then after three years of practice they received their diploma. They mainly performed their activities in St Rókus Hospital. The order was dissolved in 1948.

The practice of nursing activity was not bound to any preliminary training as in the Act of 1876 on Public Health there is no formulation of conditions in connection with that. It was the director of the hospital who was exclusively responsible for hiring nurses in public hospitals, who could not really choose suitable workforce as many times the applicants were uneducated and undisciplined (Sassy, 1891).

The role of public hospitals, which previously provided for the sick and the poor jointly, had to be changed in Hungary. In the Act XIV of 1876 on Public Health, Hungarian hospitals were divided into public hospitals and other institutions of no public interest. The main principle was to possibly admit every patient in public hospitals, while other hospitals were obliged to do that onlyif their condition was life threatening. In the regulation they tried to find a solution to treating the poor free of charge. According to the Act XXI of 1898, the National Nursing Fund (1898) settled the affair of paying for costs relating to nursing, the rules were set up by Kornél Chyzer.

Red Cross nursing training

The Red Cross movement, which spread all over Europe, did not leave Hungary untouched. The Hungarian Red Cross Association (picture) was created in a royal decree. In 1881 nursing courses with pre-determined syllabus started in Red Cross Erzsébet Hospital in Budapest, then in Kolozsvár and Pozsony. The Nursing Institute (1885) was created in Budapest on the proposal of Gyula Janny. It was also him who worked out the curriculum which was valid until 1926, this form of training was officially recognized by the Ministry of Religion and Public Education. (Prior to this, in 1884 professional and voluntary Red Cross nurse training began in several towns, but their professional centre in 1885 was in the Budapest Institute.) In the

Picture 1 Coat of Arms of the Red Cross Association of the Hungarian Sacred Crown's Countries

Picture 2 Emblem of "Voluntary Nurse" of the Hungarian Red Cross

Picture 3 Emblem of "Voluntary Auxiliary Nurse" of the Hungarian Red Cross

beginning, training lasted one year, which later was extended to two years, and completion of the training allowed for working in secular hospitals as well. It could also be regarded a forerunner of organized state training, at least in terms of its uniformity. Well-qualified Red Cross nurses held 3-6-month trainings for volunteers as well, which was highly significant during wartime. Deaconesses and Red Cross nurses tried to undertake private work, as nurses working in the public hospital system were held in very low esteem. Hospitals were built in the last two decades of the 19th century (Szent István Public Hospital, Szent Margit Public Hospital, Szent János Public Hospital, Szent László Epidemic Hospital in Budapest), at the same time they required an ever growing number of nursing staff at the end of the 19th century, which was not fully met by secular nursing trainings (Antall & Kapronczay, 1989).

Nursing training in the Austro-Hungarian Monarchy

Systematized nursing training in the territory of the Austro-Hungarian Monarchy evolved after 25 June 1914, when the first regulation (statute) was issued that dealt with professional nursing. This statute affected nursing trainings not only in Austria but also in Bohemia and Slovakia, furthermore, in terms of its contents, in Hungary as well. Around this time the first state nursing schools were created, which operated according to the rules of this act. It was a general requirement for the schools to have a two-year nursing training. Applicants could apply after they had turned 18, and they had to have a higher elementary school certificate or an equivalent certificate. Men were also admitted to the schools. The first state nursing schools had been created in Vienna (1913), then in Prague (1916) and Trieste (1916) even before the regulation was issued. Those who completed their studies in nursing in state nursing schools received the title of trained nurse (Diplomierte Krankenschwester or Diplomierter Krankenpfleger) (Kozoň, 2008a, 2008b).

Organization of secular nursing in Hungary

There were several initiatives to officially regulate nursing training within the Monarchy, but they were not successful until World War I. The initiatives of associations as civil movements were the only solutions to fostering the issue of nursing in a more uniform way (Betlehem & Oláh, 2003).

The National Association of Hungarian Male and Female Nurses, an association to protect the rights of the profession was founded by József Mihalicza in 1902. Ottó Babarczi Schwartzer, who gained reputation by fostering nursing training, was asked to be the patron of the association. Among the aims of the association, was the effort to gain appropriate social recognition for nurses, nevertheless the issue of a uniform arrangement for training was also regarded important. Nursing courses were organized on a regular basis, they undertook to improve nurses' bad social conditions and recognition, to co-ordinate 'the cultural and economic efforts of secular nurses', they set up a friendly society, fought for ensuring regular old-age retirement pension after years of service.

'…we want to make efforts for those who are the most destitute, who have always been alone so far, who have not had an official advocate. This gathering must bring about the fulfilment of our wishes, we want to learn because we feel that

Picture 4 Emblem of the National Association of Hungarian Male and Female Nurses

we cannot really serve the benefit of sick humanity… ' (Balázs, 1932).

The first nursing and bath courses licensed by the Home Secretary started in 1906. The theoretical exam was taken after a year's training with a government commissioner as chair, then after two years of practice they received their comprehensive diploma. The organization endured hardship during World War I, butcontinued their operation under difficult circumstances. The number of those who took the theoretical exam between 1918 and 1932 . was 914

Legal protection for the members of the association was ensured if necessary. Another lasting performance of the association was the the "Healthcare Employees' Journal" published by the association from 1920. The paper was renamed "Nursing Issue" from September 1932. The Nursing Issue (Healthcare Employees' Journal) became the official journal of the National Association of Male and Female Nurses and the Association of Bath Nurses under the auspices of under-secretary Dr Kornél Scholtz, a Roman Catholic university professor. The editor-in-chief was Dr Lajos Antal, the editorial work was done by József F. Szieben. Following the opening announcement, deputy under-secretary Dr Tibor Győry wrote a few words of encouragement on the status of nursing in Hungary at the end of the 1920s and the beginning of the 1930s (Betlehem, 2003).

The Providence Association was created on an initiative in the capital, and operated until the end of World War I. Training followed western examples, and trainees could absolve their practice in their own hospitals. This primarily ensured the new generation of nurses in the hospitals of the capital (picture: visit of Archduchess Augusta and baron Samu Hazai, Minister of Defence to Providence Hospital. Source: Illustrated Chronicle of the World War, 1 November 1914).

According to the National Public Health Council, training for hospital nurses was satisfactory only if they were organized either by the Red Cross Association or the Providence Association. The former prepared nurses for hospital care, while the latter association prepared nurses for home care. It was suggested that the designation 'officially qualified nurse' was necessary to introduce in the case of skilled nurses (Janny, 1909).

The Hungarian Surgeons' Society also thought it was urgent to tackle nursing training at the turn of the century. They thought it would have been useful to hold residential trainings in hospitals in greater numbers. They did not think it was enough to be a member of the nurses' association in order to be employed, as they required that the courses should provide a more thorough preparation for the profession.

Reforms prior to World War I did not bring about any significant change in the training and practice of nursing staff as untrained nurses of orders and trained secular nurses in fewer numbers performed the majority of the nursing duties at the time.

Training of nurses and health visitors

The White Cross Orphanage Association was founded in 1885 by obstretician Mór Szalárdy, who performed his activities in Szent Rókus Hospital. The association was primarily created to care for abandoned children, among whom mortality rate was extremely high. The organization of child protection on a national level also became the duty of the association in 1898 (Hahn, 1960). Mother and child protection received special attention at the beginning of the 20th century, as it became such an enormous problem that the co-operation of local authorities and the society was needed to manage it. A central role was played in this by the National Stefánia Association formed in 1915 (Jelentés, 1917). The same year a course on mother and infant health visiting was started by the association. Admission requirements were, in addition to being able to read and write, a four-year higher elementary school certificate and irreproachable morals. Mother and child health visit-

Picture 5 Archduke Ferenc Salvátor is appointed Inspector General of voluntary nursing during World War I.

Picture 6 Nurses sent to Sofia by the Hungarian Red Cross Association, Vasárnapi Újság, 1912., 59; 45:910.

Picture 7 Emblem of the Hungarian Stefánia Association

ing diploma courses were held every six months from 1916. Those who had completed the course were employed by the association itself in its national network through its Central Office with the aim of caring for pregnant and child-bearing women, women in labour and breast feeding women as well as caring for new-born babies and infants. Regarding its national feature, this civil initiative performed its duties under the control of the Ministry of Home Affairs from 1917, but with state powers. Defined duties of the association were to protect mothers in protective institutes, to protect infants and young children in protective institutes, to carry out healthcare publicity as well as to organize one-year health visiting courses. Training costs were fully paid by the state (Szénásy, 1997). The Treaty of Trianon, which closed World War I, made it almost impossible for the organization to work, thus its substantive operation could start again in 1922 after lengthy reorganization. Nurses who received their diploma in the Mother and Child Health Visiting Institute from 1925 comprised primarily of healthcare assistants . The requirement for taking part in the restarted courses was now to have a four-year grammar school certificate. Practical training took place in the first six months which was followed by ten-months theoretical education. Afterwards completing a six-month practical training qualified for the diploma. Nurses trained in this way did healthcare and social work as well (Keller, 1926).

The legal base (Act XXXI of 1925) for setting up the Hungarian Royal Public Health Institute (OKI) was created in 1926, however its operation under the direction of Béla Johan started in 1927. The creation of the institute and its decreasing support for five years was supported by the Rockefeller Foundation (Johan, 1925). The role of OKI in education was determined along two main aims:

- medical officer training (later district physician)
- Medical Assistants training

Plans of the State Nursing and Health Visiting Institute to train assisting medical staff were worked out in 1926. Through this they would have liked to organize, under uniform direction, the very different, primarily nursing and partly health visiting training carried out in the country. They wished to reform nursing training within the institutional frameworks using a uniform curriculum, in a transparent way, under centralized control, with common exam assessment. A one-off donation was again provided by the Rockefeller Foundation in 1928 for the organization of healthcare administration. Within its frameworks, the State Nursing and Health Visiting Institute was built in Budapest, and held its first course in 1930. Trainings were carried out in the State Nursing and Health Visiting Institute of the University of Debrecen which had been established earlier, then in 1938 training started in the Hungarian Royal State Nursing and Health Visiting Institute of Szeged. A State Nursing and Health Visiting Institute was established later in the reannexed Kassa in 1939. Such an institute was last created in Kolozsvár in 1940. Integral part of the teaching program was nursing teaching material but it was supplemented with health protection knowledge (Bielek & Kontra, 1934). The curriculum of the trainings had a unified structure with pre-determined exam requirements that were the same everywhere. Undertakingthe training was conditional on having achieved a grammar school final exams certificate or a teaching diploma and appropriate physical fitness. At the beginning of the training, candidates had to take part in a five-month preparation, which was followed by a thirteen-month practical and theoretical training. In the end, training was completed by six-month health protection work in villages. After attending lectures on the subjects, candidates took oral exams, while at the end of the training they took a final exam (Johan, 1939).

The foundationof mother and infant health visiting training, earlier carried out on common principles at the National Stefánia Association, was comprised of public health and social fundamentals, and to a lesser degree the classical nursing training foundations of illnesses that can be traced back to diseases and their treatment. According to Johan: "whereas the professionals of Stefánia regarded the work of nursing staff as an activity primarily belonging to social and social-hygienic workers (Keller, 1927:16-17), OKI clearly rated health

Picture 8 Emblem of the Green Cross Health Protection Service

visiting service as healthcare assistance: As Béla Johan put it: a nurse is an assistant of the physician, "an actual medical assistant" (Johan, 1929: 68-69). This meant that the two organizational views conflicted though both approaches were necessary to improve society's health condition. By authorization from the Home Secretary, elaboration of the ten-year Green Cross health protection program started in the National Public Health Institute, thus organization of nationwide health protection and setting up health protection districts have been created (Johan, 1939). In order to achieve better co-ordination of work in Green Cross organizations and Stefánia Association, an agreement was made, which clarified the scope of competences of the organizations. Naturally, this allowed for a greater grounding for the activities of the Green Cross movement (Johan, 1939). That is, the interests of a non-governmental organization and a govermental organization had to be harmonized at that time. Due to the changes in social and historical relations of the era, this agreement led to Stefánia Association, because of financial troubles, transferring its mother and child protection institutional system in 1940 to the Green Cross movement, with the exception of Budapest where these institutes were transferred to the capital. At that time, 334 protection institutes and 850 health visitors belonged to Stefánia Association (Johan, 1941). From January 1941, health protection duties were provided by medical officers and nurses - who received their diploma in the state and health visiting institute - working for the Green Cross Health Protection Service under the control of the National Public Health Institute. (Nurse specialists trained by the Stefánia Association until the end of 1940 were also employed.) The National Stefánia Association ceased to exist on 31 December 1940, and it further operated called National Health Protection Association, directed – interestingly enough – by Béla Johan. The new organization performed supplementary social work in the background of the Green Cross Service preserving the green cross as a symbol.

The latest step forward, in addition to hospital care, was setting up health centres in the fight against diseases, where the professionally crucial figure was the green cross health visitor. Her duties far exceeded that of mother and child protection, as she also had duties in school healthcare, contagious patient care (tuberculosis, venereal diseases), home nursing and care. She represented the best part of health protection, prevention and guidance in the field too. It can be stated that she performed multiple tasks, community nursing and care (Johan, 1939).

Nursing after World War II.

Health visiting training was kept on between 1945 and 1954, and they issued a double-qualification diploma. After 1954, the contents of the independent 25-month health visitor qualification was determined in the Health Ministry order of 8400-4/1954 on health visiting specialized training until 1975. From 1975 the training was raised to college level in the Institute of Medical Further Education. In the beginning it lasted three, then from 1994 four years. University-level nursing training also existed for a short time from 2004. The Hungarian Nurses Association was established in 1991.

For decades after 1950, nurses were trained in healthcare vocational schools, where there were two-year basic trainings in nursing, childcare, and midwifery. The Healthcare Specialized Courses office was formed in the regulation no. 12/1962. In 1963, training in secondary schools began, from 1965 secondary and vocational healthcare regular education began. The secondary educational system which provided general healthcare basic training started in 1968, and it provided secondary final examinations certificate and a special qualification.

The Healthcare Further Education and Specialization Institute was estabilised in the regulation no. 44/1970. The qualifications of healthcare special teacher and institutional manager became college level in 1975, however, nursing training did not achieve this for another fifteen years. In 1989 the college (higher education)-level nursing training first started with the designation 'graduate nursing qualification' at HIETE, which was followed by new trainings connected to medical schools in Debrecen, Szeged and Pécs in 1993. University-level nursing training first started at the University of Pécs, College of Healthcare in 2000 (Balogh et al, 2009).

In addition to that, nursing training continued on secondary level as well:

- 1946–78: general sick-nurse, general nurse, nurse
- 1972–77: general clinical assistant, infant and childcare nurse
- 1975–96: general nurse and general assistant
- 1975–99: adult special nurse (first-degree specialization)
- 1992–96: adult special nurse technical certificate
- 1976–96: second-degree specialization

The Hungarian Nursing Association was founded in 1989, its official periodical is The Nursing Issue. The Hungarian Society of Nursing Science began its operation in 1995. The professional journal called The Nurse was the journal of the Hungarian Society of Nursing Science for a time, however recently it has been published by the professional co-operation of the Hungarian Society of Nursing Science. The Hungarian Healthcare Professionals' Chamber was formed in 2004 as a professional public body representing the interests of its members.

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2. Fundamentals of Health Insurance

BY PH.D. IMRE BONCZ

Basic types of healthcare systems

The health condition of the population is influenced by numerous factors (genetic factors, environmental factors, lifestyle, healthcare system), some of which can cause changes more rapidly, and for some it takes a longer time to cause changes in the health condition of individuals.

Historically, following social development there has been a gradually increasing and definite claim to make up for the expenses caused by illnesses and for the income loss caused by being incapable of earning a living temporarily (sick pay) or permanently (disability pension). In the Middle Ages the funds of guilds or the minermates' boxes were created for this purpose. The presence of voluntary mutual-aid sickness funds, a more organized form, strengthened in the 18th and 19th centuries.

Health insurance based on mandatory participation was first created in Germany when on the proposal of Chancellor Otto von Bismarck the compulsory health insurance of industrial workers was introduced in 1883. During the period of more than 120 years that have passed since then, the system of health insurance has continuously developed, it has gradually covered ever increasing strata of the population, and several variants of it have formed.

This chapter includes the description of the main types of healthcare-health insurance systems, the main methodological issues of healthcare financing, the main components of the structure, operation and financing of the Hungarian health insurance system.

In international practice, there are many ways of classifying healthcare systems, the most often used classification is the one built on financing features. One common characteristic of possible classifications is that each is constrained, there are no really clear categories, and there are countries which, according to their characteristics, could belong to several groups as well.

Bismarck's solidarity-based social insurance

The fundamentals of the German insurance system were laid down by the Chancellor of Germany Otto von Bismarck. The nationwide compulsory system for workers in certain industries was introduced in 1883. This was extended to work accident insurance in 1884, followed by pension insurance in 1889. Unemployment insurance was introduced in 1927. The separate nursing insurance division, the 5th pillar of the German insurance system was introduced in 1994, and the operation of the same, i. e. paying of contributions began on 1 January 1995.

The system was taken over and applied by numerous European countries among them Austria (1883), Hungary (Act XIV of 1891). For more than the past one hundred years there has been a solid development in social security the main directions of which were characterized by the increasing population segments concerned in provisions and extention of scope and quality improvement of services provided.

The financial basis of the system is the social insurance contribution which is paid by both employers and employees. The basis for access to services is contractual insurance which has greatly changed during the past hundred years. While in the beginning the system covered only a smaller segment of the population, by the end of the 20th century a 90% coverage was achieved or even exceeded in nearly all countries where such a system is in operation. On the provider side, there is a significant number of private-sector providers.

Solidarity (or equity) is an important basic principle of the system, according to which payments (contributions) are proportional to income, that is the wealthier pay more, though the use of healthcare services depends on needs (illness), not on payments.

In the cost reimbursement system (Belgium, France, Luxembourg), in many cases the patient pays for the service when he uses it. The service provider writes a bill about the services which is taken to the insurer by the patient, and the insurer reimburses the costs. The bill is reimbursed by the insurer fully or partially depending on whether co-payments for particular services of a particular country apply or not, and if they do, to what degree.

In the system of *provisions in kind* (Austria, Germany, the Netherlands, Hungary), the patient does not pay directly for the services received, or only the deductible is paid according to the current rules on co-payment. Here the insurer directly remits the reimbursement fee of services to the service provider.

Beveridge-type state healthcare service

The fundamentals of systems functioning according to the basic principles formulated by Lord Beveridge were laid down in the United Kingdom during the organization of the National Health Service (NHS), which was created in the 1946 Act on NHS and has been functioning since 1948.

The starting point for the essential logic behind the system is that welfare societies should divide their goods among citizens as equitably as possible. In healthcare it was (is) seen feasible by means of strong state control over the finances of healthcare and the provision of services.

Taxes provide the resource side for the system, and healthcare provisions are financed by them, social insurance contributions plays a lesser role. Generally every citizen is entitled to have access to services, which decades ago seemed to provide greater coverage compared to the Bismarck-type systems, however nowadays both systems function with practically up to 100% coverage.

In *centralized systems,* responsibility for organization of provisions and finances belong to the scope of the central state administration, the central government. Generally a special organization is created for this purpose, such as the National Health Service (NHS) in the United Kingdom.

In the case of a *decentralized systems,* the organization of provision (and partly ensuring finances) belongs to the scope of local public administration (the local governments of provinces, counties, towns and villages). The role of the central public administration (the state) comes down to collection of central taxes, their allocation and setting up the main rules.

Among the decentralized systems Denmark, Finland and Sweden (Northern Europe) function as stable and steady systems. The healthcare systems of Greece, Italy, Portugal and Spain (Southern Europe) should be treated as transitory systems, where in many respects the characteristics of the national healthcare system and social security are mixed.

The system built on strong self-provision (private insurance)

The case of the United States of America is the basic example for a system that is heavily built on self-provision. The healthcare system of the USA is often referred to as a private insurance system, however it must be noted that while at the beginning of the 1960s only up to 25% of healthcare expenditures were publicly financed, by the end of the 1990s the rate of public funding was already over 45%.

However, it is a fact that in the USA there was no centralized, organized system of health insurance for a long time. The health insurance market was dominated by traditional or indemnity insurers. It was a great step forward when in 1965 the public health insurance plan, covering certain social strata (people over 65, the socially disadvantaged) was introduced (Medicare, Medicaid).

The 1970s and 1980s were characterized by the spread of organizations providing managed care. Health Maintenance Organizations, Preferred Provider Organizations, Points of Service became determinant participants in the healthcare system of the USA by the end of the 1990s.

We are going to highlight two weaknesses of the American system. On the one hand, the healthcare expenditure per capita is by far the highest in the USA, but the gain obtained with this enormous sum (e.g. average life expectancy at birth) is not among the best in international comparison. Another problem of the system is that approximately 40 million Americans do not possess any health insurance. As it was mentioned, Medicare and Medicaid plans provide health insurance for the elderly and the disadvantaged, thus those who do not have insurance are mostly of active age.

Szemasko-type socialist healthcare system

A healthcare system heavily dominated by the state was created in the Soviet Union, and it was taken over by other ex-socialist countries of Central and Eastern Europe after the Second World War.

It was exclusively financed by the state, but gratuity became the supplementary source of healthcare staff income in the 1950s, 1960s. On the service provider side, there were state institutions with staff who were public servants. Generally, it was a civil right to have access to services (in Hungary since 1972).

The socialist healthcare system as superstructure ceased to exist after the political changes in 1990, however its effects are still felt today in the healthcare systems of ex-socialist countries. Most ex-socialist Eastern European countries returned to the Bismarck-type traditions after the political changes.

Table 1 Basic types and characteristics of healthcare systems

	Solidarity-based social security (Bismarck)	National healthcare services (Beveridge)	Strong self-provision (private insurance) model	Socialist healthcare (Szemasko)
Resource	Social security (from contributions)	Budget (from taxes)	Not regulated ("self-financing")	Budget
Access	Quasi-fully comprehensive insurance	As a civil right	Not regulated	As a civil right
Market	Regulated	Marginal	Unregulated	None
Providers	Mixed (private and public servant)	Mostly public servants	Mostly private	Exclusively public servant
Ownership	Public or private ownership	Generally public ownership	Private ownership	Exclusively state
Private insurers	usually a supplementary role	Marginal role	A significant role	None
Example	Austria. Germany, Netherlands, Belgium, Slovakia, France, Hungary, the Czech Republic	United Kingdom, Denmark, Finland, Norway, Sweden, Ireland, Canada	The United States of America	Soviet Union and ex-socialist countries

The Structure of Healthcare Systems in Developed Countries

Germany

The five pillars of the German social security system are health insurance (1883), work accident insurance (1884), pension insurance (1889), unemployment insurance (1927) and long-term care insurance (1994). Work accident and long-term care insurance are not separate within classical healthcare insurance provisions in several countries including Hungary, but such types of services are provided within the framework of the general health insurance system.

By the end of the 19th century, approximately 22,000 health insurance funds were in operation in Germany, which was an exemplary developmental model for modern social security systems. By the beginning of 1990s, their number was 1,200. As a result of the consolidation processes of the 90s, in mid-1999 some 453 social security funds provided health insurance for 72 million German citizens (50.7 million insured plus their relatives). All 453 funds operate on non-profit principles and are controlled by local governments. However, there is a gradually decreasing tendency in the number of funds. Their number in 2004 was only 292, whereas by 2010 it fell under 200 (171). The funds are shown in table 2.

For a long time the insured in Germany belonged to certain health insurance funds according to where they lived or what their occupation was. With regard to switching between health insurance funds, after some allowance was made, approximately 50 % of the population were entitled to choose between the insurance funds under certain conditions by the beginning of the 1990s. Since 1996 it has been possible for the insured to choose freely from among health insurance funds. It became legally possible for regional general funds and supplementary funds to become open to all applicants. Corporate and trade associations' insurers could decide on their own whether they would remain closed or become open. If they have decided to become open, they are obliged to contract with every applicant. Only the agricultural work-

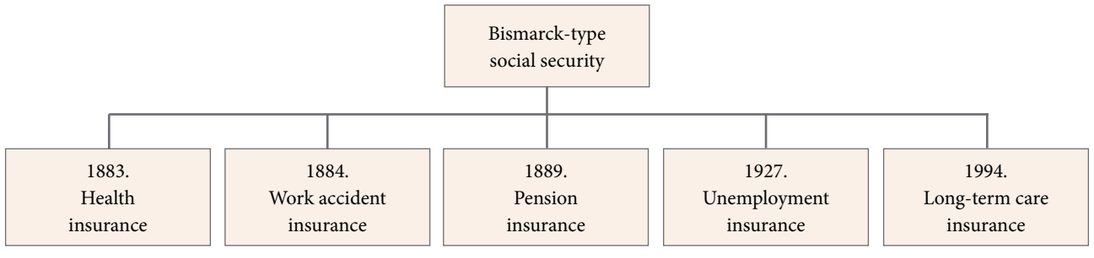


Figure 1 The five pillars of the German social security system

Table 2. Types and number of compulsory health insurers in Germany (1999, 2004, 2010)

Type	German name	Headquarters	Number		
			1999	*2004*	*2010*
Regional general insurers	Allgemeine Ortskrankenkassen (AOK)	Bonn	17	17	14
Corporate health insurers	Betriebskrankenkassen (BKK)	Essen	359	229	130
Trade Associations' Health Insurers	Innungskrankenkassen (IKK)	Bergisch-Gladbach	42	20	9
Agricultural workers' funds	Landwirtschaftliche Krankenkassen (LKK)	Kassel	20	14	9
Miners' funds	Bundesknappschaft	Bochum	1	1	1
Sailors' funds	See-Krankenkasse	Hamburg	1	1	1
Supplementary funds	Ersatzkassen	Siegburg	13	10	7
			453	*292*	*171*

ers', miners' and sailors' funds remained closed with exclusive membership for their related professional circle. It is possible to modify the choice of health insurance funds once a year with a grace period of three months.

As a result of switching between funds, AOK lost 479,000 members in 1997, 400,000 members in 1998, 292,000 members in 1999, while during the same periods BKK obtained 335,000; 516,000; and 971,000 new members.

Approximately 72 million German inhabitants receive provision from the national (social) insurance, while 8.5 million are privately insured.

In Germany it is compulsory to join the mandatory social security for those whose income is below a determined level. This income limit was DEM77,400 per year in the western provinces in 2000, whereas in the eastern provinces it was DEM63,900 per year (DEM= German mark). It is not compulsory but possible to join above this income level. If the citizen does not want to join the compulsory social insurance, he can choose private insurance.

Private insurance tasks are covered by 52 private insurers out of which 25 companies trade their shares on the stock exchange as well. Private insurance concerns some 10% of the population (about 8.5 million people). These insurers syndicate in a national organization (PKV:Verband der privaten Krankenversicherung). Apart from the 52 large insurers, there are 45 very small, mostly regional private insurers.

The role of private insurers is essentially a double role: substitution and supplement. On the one hand, complete (basic) insurance is provided for those not taking part in compulsory social insurance (substituting role), on the other hand, supplementary insurance is offered in addition to/ over the compulsory social insurance (supplementary role).

The rate of the premium is influenced by several factors (age, gender, medical history), and an extra fee has to be paid for spouses or children. Since 2010 the health insurance contribution is equally shared by employers and employees (15.5%).

In compulsory social insurance, the insurer pays directly to the service provider, whereas in private insurance the patient pays for the costs of provision, then he presents the invoice to the private insurer, where the sum is paid to him.

Private insurers, which branch had approximately 7 million clients in 1997, offer complementary insurance as well,. Complementary insurance refers to the so-called extra services (e.g. a single bed, well-equipped ward).

Austria

In Austria, provincial, corporate and industrial insurers can be found as well. But here there is a much more restricted system, that is people do not have as much freedom of choice in choosing the insurer as in Germany, they are assigned to insurers according to their place of living or occupation.

In Austria, social insurance membership is compulsory irrespectively of income. Thus only complementary insurance

Table 3 Types of Austrian compulsory health insurers

Type	No
regional health insurance funds on provincial level	9
general accident insurance funds	1
agricultural workers', self-employed's funds	2
corporate funds	10
funds for miners	1
funds for railway workers	1
funds for health and accident insurance of public servants	1
	25

which is over the mandatory social insurance is provided by private insurance. In this way, for example it covers the costs of higher-comfort wards and services (special provision), the co-payment with doctors who are not in contractual relationship with the patient's insurer, or a quicker access to diagnostic and therapeutical procedures.

Approximately a third of the population has (complementary) private insurance, which is provided by for-profit insurers. Some 7% of total healthcare expenditure is covered by private health insurers.

The purchaser-provider split, that is separation of service provider and financer is typically not common in Austria: some 134 outpatient institutions, very often dentist surgeries are operated by health insurance funds. There are also examples for integration in inpatient provision.

The Netherlands

We are going to review in detail the private health insurance market of the Netherlands as they have the largest system in the European Union. The Dutch social security model includes three levels of insurance.

The first pillar is the compulsory health insurance (AWBZ) for costly long-term provisions (institutional and home care, psychiatric provisions, disability). Premiums are paid as a certain percentage of income, there is a cap which is normally set around the lowest income bracket in terms of taxation. In 2000, the rate of the premium was 10.25% up to a maximum income of EUR22,232.

The second pillar means insurance for "normal" healthcare provisions (general practitioner, specialist treatment, etc.). This is, on the one hand, regulated by the Social Health Insurance Act (ZFW), which orders a compulsory membership for certain groups of the population, but it is already fixed to income. That is, above a certain income level (which was EUR29,310 in 2000) it is not compulsory to join. ZFW covers the costs of acute healthcare provisions. Transition between ZFW and AWBZ is relatively well-regulated. For example, ZFW usually covers the costs of hospital treatment for a maximum of one year, and if hospital care is longer, the costs of the period over one year are covered by AWBZ. Here the insured also pays a premium which is a set percentage of their salary. However, since 1989 another fixed sum has been paid apart from the percental premium. The rate of the premium is 1.75% for the employee, and 6.35% for the employer. Premiums are paid to a central General Fund, that is, it is not the insurers who collect it directly. Health Insurance Funds receive from the General Fund risk-adjusted capitation for the population belonging to them. Several risks are taken into account in the adjustment of capitation (age, gender, working capacity, region). Generally some 90% of the costs of health insurance funds are covered by incomes from capitation. For the remaining sum, every insurer sets a nominal premium which sum varies from insurer to insurer (it was between EUR156.55-223.26 in 2000). Approximately 64% of the Dutch population belong to this type of insurance. Healthcare provisions are ensured by 28 health insurance funds and by 3 funds created for public servants.

The following part of the second pillar is private insurance (WTZ: Medical Insurance Access Act), which is taken out on a voluntary basis. This concerns some 31% of the population. Standard service packages (14%) or individual packages (86%) are available for those who take out private insurance. Here the patient pays the costs of the service, which is then reimbursed to him by the insurer provided the services used by the insured are included in the service package paid. When private insurance was introduced, a disproportionate age distribution occurred between social security funds and private health insurers, namely older generations belonged to the compulsory social security system in greater numbers. Compensation for the extra costs arising from this is prescribed by the law (MOOZ) according to which those who are privately insured pay a compensation premium to the social security funds in order to reduce the costs arising from the provision for the elderly.

The third part of the second pillar is health insurance relating to public servants (ZVO: Public Servants' Medical Expenses), which is provided by three funds (IZA, IZR, DGVP).

The third pillar is complementary private insurance. This category includes those provisions which do not fall under either level I or level II. Practically a free market has evolved in this field. Most often it is used for covering the costs of

Table 4 Structure of the Dutch health insurance system until 2005

Level	Form of Insurance		
I.	*Social Insurance* (AWBZ) For long-term provisions 100% of population		
II.	*Social Insurance* (ZFW) for "normal" health provisions 64% of population	*Private Insurance* (WTZ) for "normal" health provisions 31% of population	*PublicSservants' insurance* (ZVO) for " normal" health provisions 5% of population
III.	Complementary Private Insurance		

Quarterly capitation fees		
Insured persons not living in deprived areas		
Insured persons < 65 years	€13.00	
Insured persons 65–75 years	€14.70	
Insured persons > = 75 years	€15.40	
Insured persons living in deprived areas		
Insured persons < 65 years	€14.70	
Insured persons 65–75 years	€16.50	
Insured persons > = 75 years	€17.20	
Consultation fees	**GP**	**Practice nurse**
Consultation	€9.00	€9.00
Consultation > 20 minutes	€18.00	€18.00
Home visit	€13.50	€13.50
Home visit > 20 minutes	€22.50	€22.50
Telephone consultation	€4.50	€4.50
Repeat prescription (regardless of the number of prescription lines)	€4.50	€4.50
Vaccination	€4.50	€4.50
E-mail consultation (under certain conditions)	€4.50	€4.50
Out-of-hours services in out-of-hours cooperatives, per hour	€50.20	

Table 5 Maximum capitation fees of certain services of general practitioners and practice nurses in the Netherlands as of 2009. (Dutch Health Care Authority)

dental care, private hospital wards, alternative treatments (e.g. homeopathy). Currently some 46 private health insurers work on the Dutch market. Among them there are both for-profit and non-profit organizations. There are "mutuelle"-type funds which operate on the principle of mutuality. All health insurance funds and private insurers are members of the Association of Dutch Health Insurers (Zorgverzekeraars Nederland). Recently there has been an interesting process of merging going on at level II of the Dutch health insurance market. The new social insurance funds and private insurance funds co-operate or merge in order to keep their clients. If the client claims private insurance instead of social security, he does not need to go elsewhere, he will find the solution suitable for his needs in one place. Of course, the financial activities of the two forms of insurance are strictly separated.

The United Kingdom

GP fundholding and total purchasing pilot sites (TPPs)

The United Kingdom is an educational example of the principle of managed care working in practice within the frameworks of National Health Service. The system of GP fundholding was introduced by the "NHS Community Care Act 1990" in the United Kingdom. (The Hungarian expression forráskezelő háziorvos may express the meaning of General Practitioner (GP) fundholder.)

This reform contained several elements from which the separation of provision and purchase of healthcare services has to be highlighted. Since 1 April 1991, the organization of healthcare service provisions has been done by the NHS (National Health Service), and the function of buying services has fallen under the scope of District Health Authoroties (DHAs). This step is referred to as the major starting point for the formation of the English internal market (internal or quasi market). With respect to the English traditions, DHA was responsible for hospital finances, whereas the task of financing primary care was performed by the Family Health Service Authorities (FHSA) in the beginning. DHA and FSHA organizations were united in 1996.

In the system of GP fundholding, GPs receive money not only for the provision of normal primary care but it is also extended to other services, and this sum is managed by the GP. Depending on the contract with hospitals, he can send patients for different examinations, he can request outpatient specialist care, he can manage his part of the reimbursed pharmaceutical funds. Possible savings can be used to improve his practice according to strict rules. The gate-keeper, patient-directing function of the general practitioner is strengthened by this model. It was a voluntary option for GPs to take part in the fundholding system. In the beginning the English system favoured smaller-sized practice communities up to about 11,000 persons/fundholding. When it began in 1991, there were some 294 fundholding schemes, whereas their number reached 3,500 in 1998, which meant that 15,000 GPs took part in it.

The weakness of the fundholding system is the definition of what diseases and what services the sum at the GPs' disposal should cover. Especially with smaller practices, a severely ill patient even if carefully and professionally treated by the GP can "cause an imbalance". The intention to eliminate these effects may have encouraged the creation of larger organizations, larger risk communities. In connection with this and with the development of the system, the so-called multifund organizations have been created, which meant the connection of several fundholders. The number of these multifund organizations reached 100 by 1998 (with the participation of 2,600 GPs).

Since 1995 it has been possible to create organisations called total purchasing pilot sites (TPPs), their number in the beginning was 53. In theory, the total circle of services could be purchased by them. The circle of population receiving provision from them ranged from 12,000 to 80,000, that is the scope of provision of an organizer covered a larger community. With the development of TPPs, their number reached 80 in 1998 (1,500 participating GPs).

Of course not all the GPs liked the GP fundholding system and its different organizational forms mentioned before, and many of them opted out of the system. Some of the GPs who opted out of the GP fundholding system started a close cooperation with the regional health authorities to set purchasing priorities and strategy jointly. This form is called Commissioning Groups. Approximately 19,000 GPs worked within the framework of the fundholding system, while 7,000 worked within the framework of the commissioning groups model in 1998.

The political changes of the second half of the 1990s did not avoid the English managed care either. The Labour Party did not really like the idea of building the quasi market. They preferred elimination of the internal market and parallel to this started building a system based on cooperation and partnership. Their theses were summarized in a White Paper (The new NHS: modern and dependable). The GP fundholding system was theoretically eliminated in terms of changing priorities since 1999, but practically it was changed, and the system of primary care groups was created.

Primary Care Groups (PCGs) and Primary Care Trusts (PCTs)

The system of Primary Care Groups (PCGs) has been in operation since 1 April 1999 within the framework of reforms. These Primary care groups combine GPs belonging to the same field, for whom participation in the system is compulsory. PCGs can purchase the total range of services for their patients. Compared to previous organizations, a much larger number of population, 50,000 – 250,000 people, belong to one organizer. It can be stated that on average a PCG combines approximately 100.000 people of 20 practices. The role of health authorities created in place of DHA is oriented towards planning. The English system is not at a standstill at this level, a further development is carried out in the framework of primary care trusts (PCTs). The first primary care trusts, 17 in number, were created on 1 April 2001.

The United States of America

Although the spread of managed care planning has been seen in the past two decades, its history goes back to a much earlier time. The roots of the system built on services against predetermined fees stipulated in a contract (e.g. Kaiser) go back to the 1930s. At that time these forms were not received with much enthusiasm, and several measures – which seem quite strange today - were taken to restrict them. Doctors who participated in the system using predetermined fees were excluded from medical associations in several American states. Organizations working according to the principle of managed care did not really spread between 1930 and 1980, only 5% of the American population belonged to a managed care organization in 1980. It must be emphasized that the health insurance market was dominated by traditional or indemnity insurers in the USA in this period.

There was a significant change in 1973 when the so-called HMO Act was passed (Health Maintenance Organization Act of 1973, PL 93-222), which, through significant modification of the regulatory environment, changed the legal possibilities available for managed care organizations fundamentally. Not only did it tolerate the managed care organizations but it strongly encouraged the development of HMOs (Health Maintenance Organizations).

There were severe legal obstacles to the development of PPOs (Preferred Provider Organization) as well. In the beginning of the 1980s, in several states bills were passed that encouraged the formation of PPOs, which then started to develop rapidly. The development of PPOs had an effect on HMOs as well.

The degree to which the managed care plan is considered indemnity insurance and to what degree it is connected to the state provision forms is a key issue of the managed care principle. It can be stated that before 1990 managed care plans were mainly restricted to the private sector. However, by the mid-1990s, about 12% of Medicare participants, and about 40% of Medicaid participants took part in some managed care plan.

Although the present chapter primarily deals with managed care plans and their forms created in the United States of America, it must be emphasized that certain elements of managed care plans have been built into the health insurance system of several countries (e.g. Great Britain, the Netherlands, Germany etc.). The most important organizational forms of managed care plans in the United States are going to be reviewed below.

Health Maintenance Organization (HMO)

A classic example of managed care was the spread of HMOs, which are an educationally useful case of integrated organizational forms. Within this organization you can find the financing side embodied by the insurer and the service provider side which is primarily represented by GPs, or sometimes some spe-

cialists belonging to the main specialities. Physicians working in primary care (GPs) have a prominent role in managing provision for patients in most managed care organizations.

In most cases, the insured can only choose a doctor who belongs to the HMO, who provide primary care and in addition to that arrange for the necessary hospital treatments as well. Here a very important – but not the only – consideration is the cost factor, that is doctors carefully weigh to what further examinations or treatments they send their patients. As a result of this, the system is heavily criticized, as in many cases the coverage for certain interventions is denied by the HMO, or the patient is required to pay a contribution to the costs. However, it must also be emphasized that patient referrals are done according to very strict rules, and in the overbureaucratic American system – where lawyers will soon have nearly the same role as physicians – it is hard to imagine that undertreatments are encouraged.

Recently there has been a significant growth in numbers as to HMO membership. It can be seen in Figure 2 that HMOs participated in the health insurance of nearly 80 million American citizens in 2000. In addition to that, slightly more citizens participated in services provided by other managed care organizations.

Different forms of HMOs have evolved in the past decades (see Table 6).

The **Staff Model,** which is the basic HMO, meant the classic type of HMO when physicians provide care for the patients in the office of the HMO and use the instruments of the HMO.

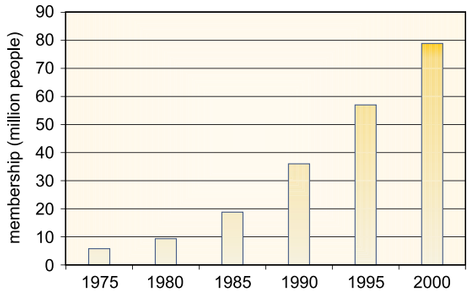


Figure 2 Changes in the membership of HMOs (1975–2000)

Physicians work as paid employees and almost exclusively provide care for the (contracted) patients of the HMO. The Staff Model is also called a closed panel model, as physicians participating in community provision cannot take part in it.

In the second type **(Group Model),** the HMO contracts with a group of physicians who are specialists of many special fields (group practice), and pays them according to the number of patients (capitation fee). Here again the physicians participating in the system usually provide care for the patients of the HMO. Physicians are genarally employed by the group and not by the HMO. Examples of this type are Kaiser Permanent or Harvard Community Health Plan. The Group model is also a closed panel HMO, because they are closed for physicians not belonging to them.

The network form **(Network Model)** is a form of Group Model where the HMO contracts with two or more group practices who are usually paid on the basis of capitation fees. It can be called an open form (open-panel HMO), as doctors who qualify for the HMO or group criteria are not excluded fom participation.

With the next type (IPA= **Independent Practice Association**), the HMO contracts with the association of individual physicians who provide care for their patients in their own offices. Physicians can provide for patients outside the HMO, and it is also possible to join for physicians who meet the requirements. A particular physician may as well belong to several IPAs. HMOs usually finance IPAs using capitation fees, whereas IPAs pay physicians using either fee for service or a combination of fee for service and capitation.

The base for a mixed form (Mixed Model) is usually a Staff or Group Model, which, for opening, contracts with individual physicians mentioned before.

Table 7 includes the main American HMOs and their membership. Membership of the organizations listed in the table comprise approximately three quaters of the membership of HMOs.

Preferred Provider Organization (PPO)

The development of PPOs practically began after 1984, offering an alternative to HMOs. A reverse approach to the structure of PPOs is possible in comparison to HMOs. Here a group of different healthcare providers (GPs, specialists, hospitals as well) contract with employers, insurance companies or third party payers in order to provide healthcare services to a group of potential patients. Services are not paid for in advance – unlike in HMOs – or fixed but are paid as fee-for-service, where different reductions are offered to service providers according to advance negotiations. Outpatient care is usually fee-for-service, whereas inpatient provision is financed on DRG basis. These fees are however reduced, lower than the normal fees.

In terms of financing risk, PPOs cannot really be regarded as insurers, since it is not them who bear the financial risk, as opposed to HMOs. In terms of ownership, there are approximately 15 forms of PPOs, that is, indemnity insurers, hospitals, (groups of) doctors, Blue Cross/Blue Shield, enterprises etc. can be PPO owners.

Providers, primarily hospitals, are guaranteed a certain number of patients through these contracts. This form increases the efficiency of co-operation between GPs and hospitals. It is important for the patient to be able to go to a specialist without a referral. He also has a greater freedom of choice as he can choose a doctor outside the network, although in such a case he has to pay the amount over the contracted fee.

Table 6 Main types and features of HMOs

Type	Owner of office	Fees of physicians	Other
Staff Model	HMO	Paid employee	Exclusively for HMO members
Group Model	Group of physicians	Capitation	Usually for HMO members, contract between the HMO and the group of physicians
Network Model	Group of physicians	Capitation	HMO contracts with two or more group practices
IPA Model	Individual physician	Fee for service and capitation	C between the medical association and the HMO
Mixed Model		Mixed	Opening of Staff or Group Model towards the IPA model

Patients have a greater freedom of choice than with the initial form of HMOs (though, as it could be seen, HMOs also open toward providers outside). PPOs cover an average of 90-100% of services provided by their own providers, while they cover an average of 60-70% of provision if external providers are used.

Compared to HMOs, PPOs are closer to indemnity insurers, and their legal regulation is determined by insurance statutes and not by the Act on HMO. According to data as of 2001, healthcare provision was provided by PPO-type managed care organizations for more than 90 million Americans.

C) Point-of-service (POS)

A point-of-service organization seems to be a hybrid form toward indemnity insurers and PPOs which were created by HMOs for clients who did not like the limitations within HMOs. In this form the insured patient – usually for a higher premium – can use a service provider outside the HMO as well, and he has to pay co-payment there.

Two basic types of POS can be differentiated. One of them uses an existing HMO network, and contracts similarly to HMO. It is also possible to share the risk in a subsidiary contract with providers who are outside the HMO network. The other basic type uses an existing PPO network.

Similarly to HMOs, in POS organizations primary care physicians (GPs) provide for the coordination of further care to patients. Similarly to PPOs, the scope of services is well-defined.

D) Exclusive Provider Organization (EPO)

EPOs are similar organizations to PPOs with the difference in the range of providers, as they only include providers that can be found on their providers' list. Namely, while PPOs prefer the provider chosen by the patient, but – under determined conditions – they allow using an external provider, EPOs exclusively prescribe it. Similarly to EPOs, HMOs have a strong gate-keeper function for using services. Regulation of EPOs, like that of PPOs, is ensured by statutes on insurance, not by the Act on HMOs.

Table 7 Membership of American HMOs in 2009 (AIS's Directory of Health Plans)

Firm	Membership
WellPoint, Inc.	33.952.110
UnitedHealth Group, Inc.	31.980.000
Aetna, Inc.	18.557.996
Health Care Service Corporation	12.400.000
CIGNA HealthCare, Inc.	11.131.599
Kaiser Permanente	8.722.019
Humana, Inc.	8.359.031
Health Net, Inc.	6.659.000
Blue Cross Blue Shield of Michigan	4.548.575
Highmark, Inc.	4.114.476
Coventry Health and Life Insurance Company	3.603.910
AmeriHealth Mercy/Independence Blue Cross	3.599.371
Blue Cross and Blue Shield of Alabama	3.570.223
CareFirst BlueCross BlueShield	3.330.926
Medical Mutual of Ohio	3.154.334
Total	*157.683.570*

Funds Flow in Healthcare Systems

There are several ways of implementing the flow of funds in healthcare systems. This flow of funds varies greatly from country to country, resulting in a completely different environment for the implementation of health insurance and healthcare financing systems. In the course of the funds flow review, generally the operation costs of healthcare

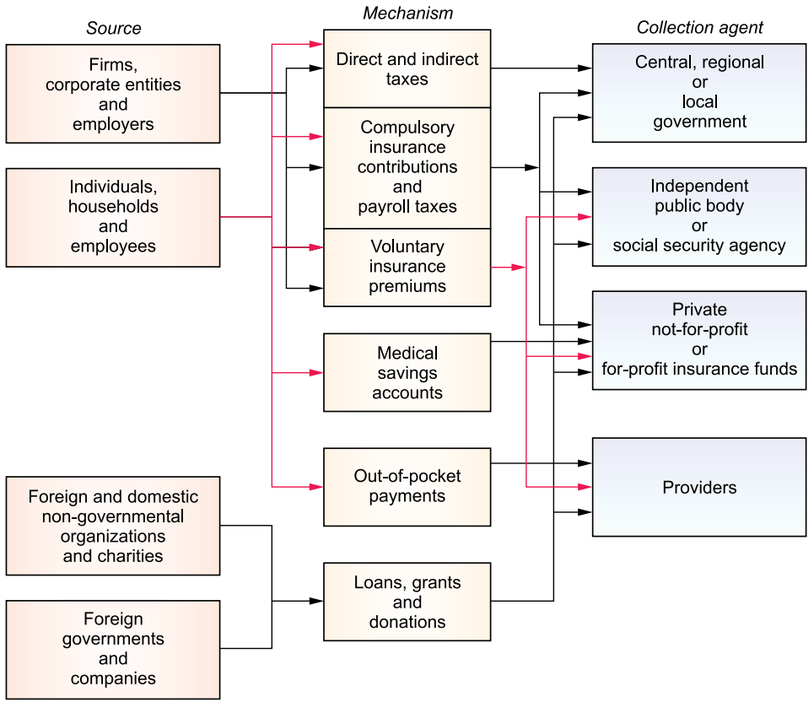


Figure 3
Examples of funds flow

services are going to be discussed and the specialities of capital costs (depreciation) are not going to be included here.

Generation of funds

The funds that cover healthcare expenditures can be determined in several forms. Generally, taxes are used to finance healthcare expenditures in Beveridge-type national healthcare service systems. Social insurance contribution constitutes the coverage for healthcare expenditures in Bismarck-type social insurance systems based on solidarity. Insurance premium has a bigger or smaller role in systems built on strong self-provision, which often means private insurance – the healthcare system of the United States of America falls into this category with its system regarded as a private insurance system by many.

It must be underlined that nowadays the elements of the asset side are mixed and the boundaries according to the classic superstructure are beginning to blur in the healthcare systems of most countries. Today nearly 50% of health expenditures is covered by community sources in the healthcare system of the United States of America (Medicare, Medicaid). Tax-type sources also appear as coverage for health expenditures in social insurance systems – in Hungary as well. Since the mid-1970s the rate of state participation has gradually been decreasing in national healthcare services.

Collection of funds

The next important issue of funds flow is who collects insurance premiums. A frequent solution is when revenues go into a central fund. Since 1999 there has been a similar method in use in Hungary, the Tax and Financial Control Administration has been collecting the social insurance contribution since then.

It is an existing solution that insurers collect the premiums directly, this can be seen in its clear form with American, generally indemnity, health insurers.In some countries a mixed method is used, when part of the fees is collected by the central fund, and the other part is collected directly by the insurer. In the case of the Netherlands, contribution measured in percentage is collected by the central fund, whereas the nominal (fixed sum) contribution is collected by the insurers themselves.

Allocation of funds

The next step after the collection of fees is the distribution of the fees among the individual financing units or risk communities. Giving a practical example: the way the contributions collected by the central fund should be distributed among some 200-300 health insurers (krankenkasse) in Germany, or some 30 health insurers in the Netherlands.

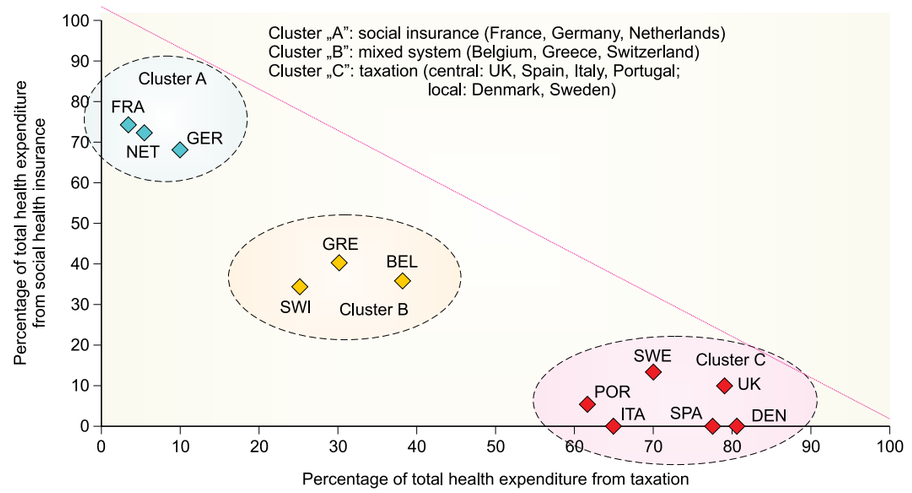


Figure 4
Collection of sources

A general tool of funds allocation is to determine the capitation, which is a certain amount determined for one inhabitant (insured). Considering the fact that there may be inequalities in the distribution and characteristics of the population, these have to be adjusted. Namely, insurers may try to obtain higher-income clients who at the same time are lower-health-risk clients (cream skimming). In order to eliminate this, capitation is adjusted according to certain risk factors (risk-adjusted capitation payment, RACP), and financers get this adjusted capitation. The most frequent risk factors are age and gender.

Funds can be allocated on a regional basis, when people living in a certain geographical or administrative area constitute the risk community. The composition of insurance-based risk communities arise by random registration of patients. At present, funds allocation connected to diagnosis can be regarded a theoretical option rather than a widespread practical method.

The share of capitation-based funds allocation in the Dutch health insurers' financing is illustrated in Figure 5. It can be seen that when the system started in 1992, the share of capitation-based financing was 0%, which rose to 53% by 2004. Gradual transition is very important in terms of stability and predictability. The tool of capitation was also introduced in Hungary. With GPs the use had a financial purpose, whereas in the so-called managed care pilot model it was used for allocation of funds. Further – only planned but not implemented – possible use could have been in the so-called multi-insurance system on which an act was passed by the parliament but was never implemented in reality.

Financing of service providers

After funds have been allocated, insurers (financers) will pass the funds to service providers. Several techniques can be used to carry out financing, which are going to be discussed in the next chapter. What has been said before, that is, possible and frequent pathways of health expenditures in different healthcare systems, is illustrated by the figure below.

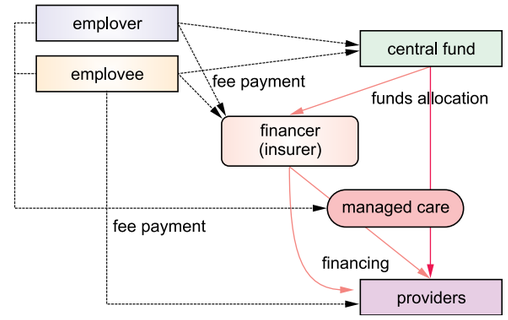


Figure 5 Risk-adjusters in capitation-based funds allocation in the Netherlands

Determination of Healthcare Expenditures

Health expenditures as a percentage of gross domestic product (GDP) and as a per capita amount in dollars in the OECD countries are illustrated in Table 8. OECD (Organisation for Economic Co-operation and Development) is comprised of the economically most developed 30 countries of the world. Analysis of these countries' data shows that there are huge differences regarding expenditures even within this group of countries.

The United States has the highest expenditure, where the annual expenditure reaches 16% of the GDP, 7,290 dollars per capita. This is double the health expenditure of developed European countries (e.g. Germany, the United King-

Table 8 Fejkvóta alapú forrásallokáció kockázatkiigazító tényezői Hollandiában

Year	% of expenditure at full risk for sickness funds	Risk-adjusters	High-risk pool
1992	0	–	–
1993–1995	3	Age, gender	–
1996	15	Age, gender, region disability status	–
1997	27	Age, gender, region disability status	90% of annual expenditure above € 2 036
1998	29	Age, gender, employment/social security status	90% of annual expenditure above € 2 036
1999	35	Age, gender, employment/social security status	90% of annual expenditure above € 3 394
2000	36	Age, gender, employment/social security status	90% of annual expenditure above € 4 538
2001	38	Age, gender, employment/social security status	90% of annual expenditure above € 4 538
2002	41	Age, gender, employment/social security status, Pharmacy-based Cost Groups	90% of annual expenditure above € 7 500
2003	52	Age, gender, employment/social security status, Pharmacy-based Cost Groups	90% of annual expenditure above € 7 500
2004	53	Age, gender, employment/social security status, Pharmacy-based Cost Groups, Diagonistic Cost Groups	90% of annual expenditure above € 12 500

dom), and more than ten times higher than the lowest-expenditure values of Turkey. Hungary ranks 27th according to total per capita health expenditure, 26th according to public health expenditure, while it is 24th regarding expenditure as a proportion of GDP. Total per capita health expenditure is 46.4% of the OECD average, public health expenditure is 45.7% of the OECD average. That is, public expenditure is a little behind total health expenditure. In view of the fact that the data in the table is from 2007, and in Hungary the reduction on public spending was already being felt in 2008-2009, the negative impact in Hungary – may have increased since then.

Among the examined OECD countries Hungary ranks 26th according to per capita GDP which reflects the economic development of countries. It could imply that Hungary's health expenditure is in accordance with its economic performance and possibilities. On the other hand, Hungarian GDP is 56.4% of the OECD average, however health expenditure values are far behind OECD average (46.4% and 45.7%). Thus, on these grounds further reserves could be identified.

When compared with the neighbouring countries, it can be seen that the Czech Republic (6.8%) and Poland (6.4%) spend less, but Slovakia (7.7%) spends more than Hungary (7.4%) related to their GDP. However, the same tendency can be seen with regard to total per capita health expenditure and public health expenditure: the expenditures of the Czech Republic and Slovakia are higher, while those of Poland are lower.

The same health expenditures are illustrated in Figure 7 as a percentage of GDP and per capita. Here particular groups of countries are better identifed. In the lower segment there are the Central Eastern European countries (the Czech Republic, Poland, Hungary, Slovakia) and Turkey, Mexico, Korea, where a lower level of expenditure is typical. In the middle the balanced countries can be found (Japan, UK, Finland, Italy, New Zealand, Spain). Luxembourg, Norway and Switzerland show an outstanding value. It is striking that the United States (USA) has an outsider figure in the chart.

Changes in health expenditures from 1960 to 2007 are shown in some selected countries (Austria, the Czech Republic, France, Germany, Hungary, Norway, Slovakia, Sweden, Switzerland, the United Kingdom, the United States). It can be stated as a rule of thumb that GDP-proportional expenditures rose two-three times during the examined period.

Table 9 Per capita health expenditure as percentage of GDP and per capita GDP around 2007 (Source: OECD, World Bank)

Ország	Eü. kiadás a GDP%-ában		Egy főre eső összes eü. kiadás		Egy főre eső eü. köz-kiadás		GDP per capita	
	GDP%-a	sorrend	USD, PPP	sorrend	USD, PPP	sorrend	USD, PPP	sorrend
United States	16,0	1.	7.290	1.	3.307	3.	46.716	3.
Norway	8,9	16.	4.763	2.	4.005	1.	51.862	2.
Switzerland	10,8	3.	4.417	3.	2.618	12.	37.396	6.
Luxembourg	7,3	25.	4.162	4.	3.782	2.	77.089	1.
Canada	10,1	7.	3.895	5.	2.726	10.	38.290	5.
Netherlands	9,8	10.	3.837	6.	2.069	18.	36.099	7.
Austria	10,1	6.	3.763	7.	2.875	5.	35.523	10.
France	11,0	2.	3.601	8.	2.844	6.	31.980	17.
Belgium	10,2	5.	3.595	9.	2.194	15.	33.243	14.
Germany	10,4	4.	3.588	10.	2.758	8.	31.980	18.
Denmark	9,8	9.	3.512	11.	2.968	4.	35.125	11.
Ireland	7,6	23.	3.424	12.	2.762	7.	40.823	4.
Australia	8,9	15.	3.357	13.	2.266	14.	35.677	9.
Sweden	9,1	13.	3.323	14.	2.716	11.	34.056	13.
Iceland	9,3	12.	3.319	15.	2.739	9.	35.814	8.
United Kingdom	8,4	19.	2.992	16.	2.446	13.	32.654	16.
Finland	8,2	20.	2.840	17.	2.120	16.	32.903	15.
Greece	9,6	11.	2.727	18.	1.646	22.	31.290	19.
Italy	8,7	17.	2.686	19.	2.056	19.	28.828	21.
Spain	8,5	18.	2.671	20.	1.917	21.	29.208	20.
Japan	8,1	21.	2.581	21.	2.097	17.	34. 099	12.
New Zealand	9,0	14.	2.454	22.	1.937	20.	27.027	23.
Portugal	9,9	8.	2.150	23.	1.538	23.	20.845	25.
Korea	6,3	28.	1.688	24.	927	27.	27.939	22.
Czech Republic	6,8	26.	1.626	25.	1.385	24.	22.004	24.
Slovak Republic	7,7	22.	1.555	26.	1.040	25.	17.837	27.
Hungary	**7,4**	**24.**	**1.388**	**27.**	**980**	**26.**	**18.154**	**26.**
Poland	6,4	27.	1.035	28.	733	28.	14.675	28.
Mexico	5,9	29.	823	29.	372	30.	14.495	29.
Turkey	5,7	30.	618	30.	441	29.	11.535	30.
Average	*8,9*	–	*2.989*	–	*2.142*	–	*32.172*	–
Hungary/average	–	–	*46,4%*	–	*45,7%*	–	*56,4%*	–

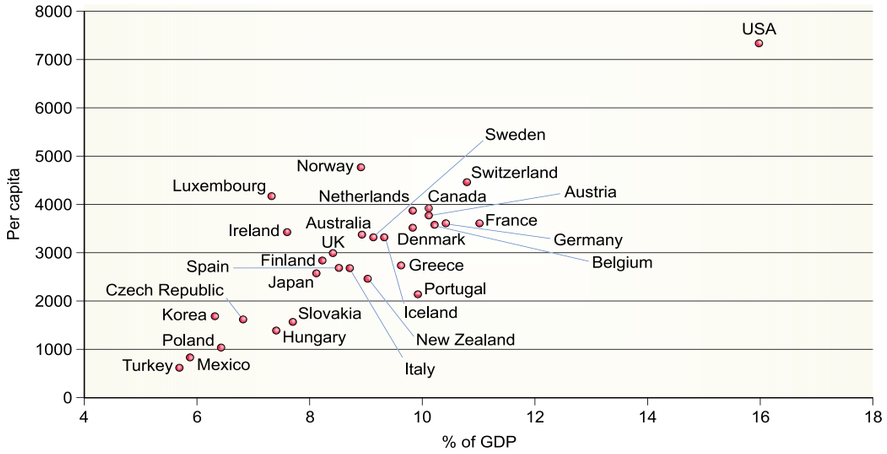
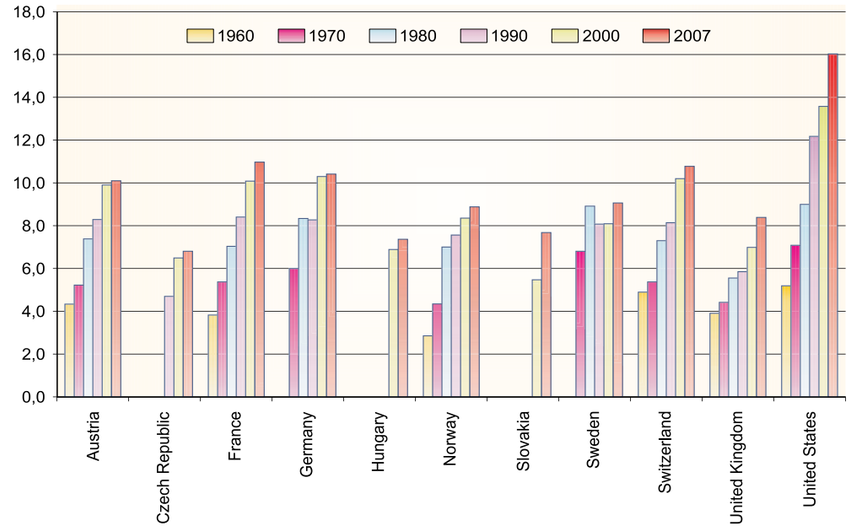


Figure 6 Per capita health expenditure as a percentage of GDP and per capita GDP around 2007 (Source: OECD)

Figure 7 Health expenditures as a percentage of GDP in some selected OECD countries (1960, 1970, 1980, 1990, 2000, 2007) (Source: OECD)



Financing Techniques in Healthcare

Continuous increases in healthcare expenditures has urged financers to refine the techniques used in financing. During this process, several methods have been developed, some principal options of which are going to be outlinedbelow.

Financing healthcare services

There was a serious problem in the American financing system in the 1960s and 1970s. Financing of healthcare services was carried out afterwards on the basis of bills (retrospective payment). However, this led to a significant increase in costs, since providers were not interested in cutting down on costs. It was necessary to develop a system in which financing of services rendered is done on the basis of predetermined fees.

A solution to this severe problem is to increase theuse of the principle of "prospective payment system, PPS". In this system, the scope of services that a hospital can offer is predefined, furthermore, the charges for services are determined in advance. In such a case, the provider is interested in curbing the costs, as the pre-determined charge is paid for a given service (e.g. a hernia operation) even if the costs are lower (saving) or higher (loss). The DRG system, which is going to be discussed later, has been introduced on the basis of the PPS principle.

Fixed input systems (base financing)

In this system, a basic input is determined in advance for the providers (global budget), which they can manage freely. This basic input can be determined by means of two methods: capacity financing or task financing.

In the case of *capacity financing*, a capacity indicator (number of beds, hours etc.) characteristic of the given service is used to determine the budget. Thus in systems like these financing is independent of the actual performance and quality. The provider is essentially interested in contracting for as high capacity as possible (e.g. increase in the number of beds), at the same time it is interested in providing as little and as cheap service as possible. A characteristic feature of the system is the increase in artificial utilization. The provider is not at all interested in cost-efficient operation, since if there are savings from the base then it turns out that the base is high and next time it will be reduced. But this financing technique is quite simple and cheap. There is no need for measurement of performance or monitoring, there is no need to maintain staff to do that. Another advantage for the provider is the fact that revenues can be calculated quite securely, by which planning is greatly helped. With all this, this system is the least efficient form of financing.

Task financing is another mode of base financing. Here too, the provider can expect a fixed sum during a given period, however, it is determined not by capacity but in connection with a task. The input is determined on the basis of performance in previous years or normative costs. It is a little better than capacity financing as, though the amount of money is heavily tied to needs, it is already partially connected to performance as well.

Performance-based financing

In theory, the best form of financing is when the actual work performed, the performance of the provider, is paid. However, in the healthcare industry there is a problem in measuring performance in many cases.

In performance based financing, one option is *itemized billing* (fee for service), the other is the use of *normative systems* (capitation fee, DRG).

A) Itemised billing of services (fee for services)

In respectof financing, the provider keeps a record of each examination, intervention carried out on the patient, and the interventions are listed on an itemised bill towards the financer (insurer). A great advantage of the system is that financing (the money) moves together with the patient (freedom to choose a doctor or institution).

Settlement can be directly cost-based, when the provider charges the insurer a certain amount of money (system of fees) for the examinations and interventions. This is (was) preferred by private insurance systems. Nowadays interventions are reimbursed according to different point systems (tariff or point system).

This system of financing results in the increase in the amount of services. There are also relatively high administrative costs. There are several possibilities to curb rising costs. Such was the floating point system used in Hungary until June 2000 when the forint value of a performance point changed as a resultant of the reported performance and the available funds. Determination of quotas or limitation of office hours can also mean a restriction for the providers. Setting co-payment to be paid by the patient can mean a curb on unjustified overuse of the services by the patient.

Hungary applies this model in the financing of outpatient specialist care. In other countries this technique is used to finance primary care and hospital care as well.

B) Capitation-based financing (capitation fee)

The base for capitation-type financing systems is financial support tied to some indicator. That is, the amount of support assigned to the given indicator ("per capita"). There is no significance of concrete performance measurement or itemised billing in certain frameworks in such normative systems.Such financing is carried out in the case of general practitioners' activity in Hungary, where financing is based on the cards submitted to the GP. The submitted card makes it possible for the GP to receive the capitation fee even if he did not see the patient in the given month or months either. In this patient's case, the money is not spent on the cardholder, that is,„profit" is generated. However, it happens that other patients use GP care several times in a month, and the capitation received on them does not cover the actual costs, that means , a virtual "deficit" is generated here. However, the two items usually offset each other on average.

C) Case-classification systems

Systems classifying cases according to their severity, PSI (patient severity index) – working on the basis of the stage of illness –, and APACHE – elabourated for evaluation of acute physiological and chronic states –, will be considered. In numerous cases these systems – regarding the use of detailed clinical data – make it possible to have a more exact grouping, a good prognosis of expected cost claim and of the outcome of care. However, there is a critical disadvantage to the general use of special case-classification systems:

- for every case, the clinical data needed for classification have to be determined and processed, so the costs of classification and data processing are high,
- classification is very sensitive to lack of data,
- among the aspects of classification, subjective evaluations get a role in certain systems (e.g. in the PSI system, the judgement of a permanent need for therapy),
- it matters when (at the time of admission or discharge) the severity aspects are measured to establish the group, e.g. the measurement at discharge already shows the result of the care too.

From among classifications according to resource needs, PMC systems (Patient Management Categories) can be highlighted, which have a data need very similar to that of DRG systems, but accompanying and complication diseases are considered in another way during classification. Practically, it does not make a distinction between parallel running diseases, it does not underline the main disease against complications and accompanying diseases. When the total financing point is determined, the special resource needs point is added to the joint part of the parallel events.

The PMC system can be used well in internal planning of care, in organizing the care routes, primarily in internal management of operative level. However, the motivating effect of efficiency is more moderate in financing.

Diagnosis Related Groups (DRG)

The DRG system was developed at the prestigious Yale University of the United States in the 1960s. The original purpose was to monitor the quality of care, and later in the 1970s they started to deal with using it for financing purposes. American legislation (the Congress) accepted the DRG system in 1983, and it was introduced in hospitals which belonged to the Medicare financing system. Later variants (AP-DRG = all patient DRG) were developed that are suitable for financing not only state hospitals but all inpatient institutions.

Table 10 Some examples of the internationally used DRG (HBCS) principle

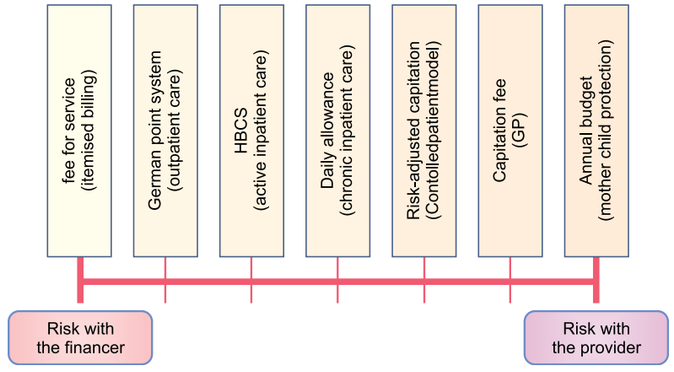
Abbreviation	Name	Ccountry
HCFA-DRG	Health Care Financing Administration DRG	USA
RDRG	Refined Diagnosis Related Groups	USA
AP-DRG	All Patient Diagnosis Related Groups	USA
APR-DRG	All Patient Refined Diagnosis Related Groups	USA
SR-DRG	Severity-Refined Diagnosis Related Groups	USA
IAP-DRG	International All Patient DRG	USA
AR-DRG	Australian Refined Diagnosis Related Groups	Australia
NordDRG	Nordic Diagnosis Related Groups	Scandinavia
GHM	Groupes homogènes de malades	France
LDF	Leistungsbezogene Diagnosen-Fallgruppen	Austria
HRG	Health Related Groups	UK
GR-DRG	German Refined Diagnosis Related Groups	Germany
DBC	Diagnose Behandeling Combinatie	Netherlands
HBCS	Homogenous Disease Groups	Hungary

Risk sharing

A further interesting issue of financing techniques is where the financing risk is placed between the financer (e.g. funds, insurer) and the provider (e.g. hospital, specialist consultation). One extreme is the clear performance-based financing (fee for service), in which the financer bears full risk. In such a case the financer is obliged to pay an ever higher sum when the performance of the providers is enhanced. During the Czech health reform of the 1990s, there were a lot of unpleasant experiences in connection with increased provider activity. The other extreme is the annual (global) budget when the healthcare provider (e.g. hospital) knows at the beginning of the year what financing revenues it can calculate with for the whole year. In this case the provider is not interested in enhancing performance (number of patients) as income will not grow parallel to this. However, if there is an extraordinary event or series of events (e.g. an epidemic, an accident involving a lot of casualties, etc.), it can cause a problem for the provider to cover this from the annual budget set in advance.

The financing forms mentioned before are summarised in Figure 10.

Figure 8 Risk-sharing in the case of certain financing forms



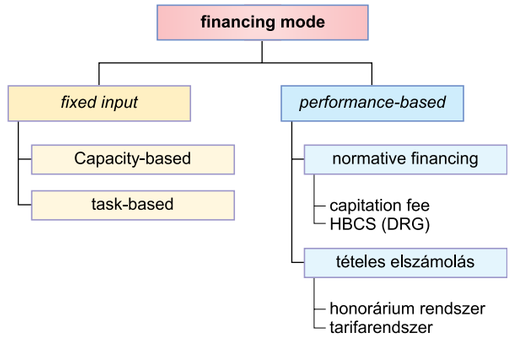


Figure 9 The financing forms mentioned before are summarised in

Techniques of price support for pharmaceuticals

Supply side regulation

A) Price regulation

There are several techniques that can be applied for the price regulation of pharmaceuticals. Statutory pricing means a price declared in a statute from which the manufacturer/distributor cannot differ considerably. A price cap is a predetermined top price level from which they cango below but not above.. Price freezes are a very popular regulatory tool where pharmaceutical prices are fixed at a given level, usually for a predetermined time period. This is very often combined with simultaneous agreements between the government and manufacturers, which happened several times in Hungary as well. Cost-plus pricing is a pricing practice in which not only the cost of production is taken into account but other cost elements too, such as promotion costs or the profit rate, which are usually expressed as a percentage of costs.

External price referencing or international price comparison compares the prices of the given product in different countries, and the domestic price is set in this way.

Internal price referencing, unlike the ones mentioned previously, compares products which have the same agent (ATC 5) or similar agent (ATC4) as well as products which are of therapeutic equivalence. It is usually applied through reference pricing which is a highlighted issue in our study.

And here mention may be made of cost-efficiency analyses as well, when the costs and efficacy of a given product are compared with the similar parameters of a comparative product which is already on the market.

B) Direct expenditure control

Price regulation in itself ensures that the individual products are reimbursed by social insurance, however, without information on trading data it has no real effect on drug expenditure control. That is why direct restriction tools on expenditure can be applied, which allow for a macro-level control of pharmaceutical expenditures through price and turnover being calculated together.

A discount is a special reduction in the price of a product ensured for a particular business partner (a hospital), which can result from possible negotiations but it can also be an integral part of drug policy. Rebates mean that a certain trade volume is returned by the manufacturer/distributor to the institutional buyers. Germany, Ireland, Spain use a system similar to that.

A payback by the manufacturer/distributor is a risk-sharing mode where the support of a given product exceeds the target or cap value established by the manufacturer/distributor or their professional associations and the financing institutions. In such a case part of the extra support must be paid back to the financer.

Price-volume agreements are a volume control tool, when a conditional price of a new product and a related tunover (amount) are set. If the established turnover is exceeded, the key figures of the original agreement can be achieved by either paying back the surplus or by a follow-up reduction of the price. It is a tool used in France and Spain, also applied in Hungary.

C) Profit control

Thisis the name of the system operating in the United Kingdom (UK), where profit control is used in selling original products to the NHS. In fact, it can be regarded an indirect price regulation tool.

D) Taxation aspects

What is meant by them is the direct correlation between research-development or manufacturing activity and product pricing policy. Namely, a particular product of a given manufacturer is granted a determined support by social insurance not or not only on the basis of the product features but also on the basis of the allocation in the given country of the company's research-development or manufacturing activity. An example of this can be found in Belgium. In Hungary there are also quite obvious signs and happenings relating to this, but they are carried out according to the rules and customs of political backstage negotiations, whose main feature is that decision-making is not transparent.

Demand side regulation

Through demand side tools efforts are made to regulate the behaviour and incentives of those participants who have a significant role in determining the demand for pharmaceuticals (physicians, pharmacists, patients).

A) Physician incentives

The most refined tools of medical activity are the clinical professional guidelines and prescription guidelines which regulate the framework of the activities in the medical profession.

Prescribing physicians' professional further training is accentuated through educational and information technology tools. The choice of pharmaceuticals and prescribing activity are often supported by IT tools as well. Such a prescription software was also introduced in Hungary in the course of the healthcare reform measures of 2006–2008.

Monitoring prescription habits or determining prescription quotas can be mentioned as other influencing factors. The "pharmaceutical budget" marks a pre-determined target frame that can be used to give price support for pharmaceuticals in a given area, region or practice community.

The tools mentioned above can be used in combination with material or non-material incentive mechanisms as well.

B) Patient incentives

Patients can mostly be influenced by different cost-sharing programmes. These are very widespread and – with the financing institutions – popular tools, of which there are various existing forms. Fixed co-payment is a fixed charge (e.g. prescription fee) which is to be paid when a given drug, medical aid or medical service is used. According to co-insurance or percentage co-payment, patient contribution is set as a percentage of the price. The deductible paid in advance is usually a fixed sum too, but this has to be paid before anything is paid from social insurance.

C) Pharmacist incentives

Among pharmacist incentives/tools the issue of substitution is worth mentioning in the first place. It can be voluntary (on the basis of the pharmacist's individual professional conviction) or compulsory (according to the instructions of the financer). In the framework of substitution, a particular, usually expensive, original medication is replaced with a cheaper generic product while quality standards are observed.

A determinant pharmacist incentive which influences turnover is traditional pharmacy (retail) margin. This is, however, often counterproductive to the pharmacist's own financial motivation, when they have to work against increasing their own turnover (and profit).

A claw-back allows the financing organization to claim part of the discount or rebate which appears in the price support system.

D) Price supports

Price support of pharmaceuticals is very significant in terms of turnover. Different financing organizations can use different price support principles and degrees. Percentage price support and fixed sum price supports are of general use. Positive lists enumerate prescription pharmaceuticals that are not specifically regulated and are price-supported. Negative lists enumerate pharmaceuticals which cannot be reimbursed.

Reference pricing, which has outstanding importance in terms of fixing, belongs to price support tools.

Table 11 Application of supply side tools (Source: EASP Questionnaire/Espin, Rovira)

Country	Product price requlation							Control of expenditure					Industry requlation			Product reimbursement				
	inital price decision					controlled price updates	other	use of discounts / rabates	pay-back	price-volume agreements	use of price-freezes and cuts	other	profit controll	tax benefits	other	reference price system	positive lists	negative lists	based on economic evaluation	other
	based on clinical performance	based on economic evaluation		based on cost of existing treatmens	based on cost-plus calculations	based on international prices														
AT	+	+	+		+		+	+				+					+		+	
BE	+	+	+		+	+			+		+			+		+	+		+	
CY				ø	+								ø		+		+			
DE								+			ø	+				+		+		
DK							+			o	ø					+	+		+	
EE		+	+		+					+						+	+		+	
EL				+ ø	+	+		+			+					+	ø		ø	
ES	+		+	+	+	+		+	ø	ø	+			+		+	ø	ø		
FI	+	+	+		+	+	+				+						+	+	+	
FR	+		+		+			+	+	+	+						+			
HU			+		+			+	+	+	ø			+		+	+	+	+	
IE	+	+	+		+			+			+						+		+	
IT	+	+	+		o	+		+	+		+		+			+	+		+	
LT					+	+						ø				+	+		+	
LV	+	+	+			+				+						+	+		+	+
MT												+			+		+		+	
NL					+						+	+			+	+	+		+	
NO					+					+	+					ø	+	+	+	
PL	+				+											+	+		+	
PT	+	+	+		+	+	+		+	+	+			+		+	+		+	+
RO					+	+		+	+		ø		+	+		+	+	ø		
SE	ø	+	ø		ø		+	ø		+						ø	+		+	
SK	+	+			+	+				+			+			+	+		+	
SI		+			+	+	+				ø	+				+	+		+	+
UK						+	+		+		+		+	+				+		

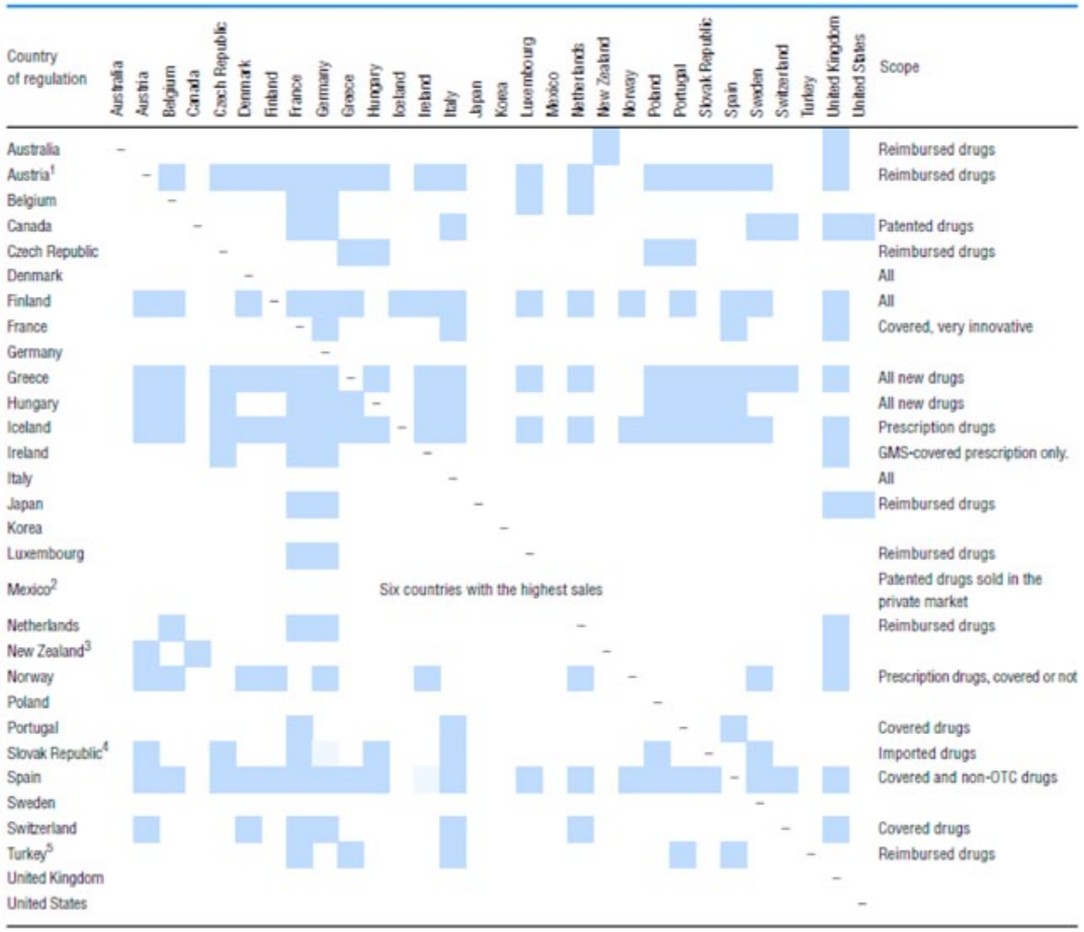
\+ Currently applied
ø Once applied but discountinued

Table 12 Application of demand side tools (Source: EASP Questionnaire/Espin, Rovira)

Country	Physicians					Patients				Pharmacists			
	clinical practices/prescriptions guidellnes	educational and information	monitoring of prescribing patterns	prescription quotas	pharmaceutical budgets	financial incentives	information education campaigns	cost sharing	other	generic substitution	financial incentives	claw-back	other
AT	+	+	+			+	+	+				+	
BE	+	+	+	+		+	+	+				+	
CY										+			
DE	+	+	+	+		+	+	+	+	+	+		+
DK	+	+	+				+	+		+			
EE	+	+					+	+		+			
EL			+				ø					+	
ES	+	+	+	+	+	+	+	+	+	+	ø		+
FI	+	+	+				+	+	+	+			+
FR	+	+	+				+			+	+		
HU	+		+					+		+			
IE		+	+			ø	+	+		+	+		
IT	+	+	+				+	+		+	+	+	
LT	+			ø		ø		+		+	+		
LV	+	ø	+	+	+		ø	+		+			
MT	+	ø	ø							+			
NL	+	+	+			+	+	+		+		+	
NO	+	+	+	+			+	+		+			
PL		+						+		+			
PT	+	+	+				+	+	+	+			
RO		+	+		+		+	+		+			
SE	+	+	+		+	+	+	+		+			
SK	+	+	+		ø		ø	+		+			
SI	+	+	+					+		+			
UK	+	+	+		+	+	+	+		+		+	

\+ Currently applied
ø Once applied but discountinued

Table 13 Application of external price-benchmarking in OECD countries (2007) (Source: OECD)



Use of pharmaceutical-market regulation techniques in individual countries

The next three tables (6-7-8) show which countries applyin practice the afore mentioned demand and supply side tools.

Health-economic analyses

It is difficult to measure costs and outcomes gained through them in healthcare provider systems in many cases. Although it is not an easy task to determine and separate costs in such complicated and complex systems like healthcare, the real problem is to render a numerical value for gain (profit).

The key problem is to measure the consequences of medical provisions, interventions.

Role and significance of health-economic analyses

For centuries in the history of medical development, one of the significant challenges has been finding effective therapies. As an effect of the technological development and social transformation in the 20th century, more and more effective but at the same time more and more costly medical procedures (diagnostic and therapeutic interventions, pharmeceuticals, medical aids etc.) have appeared and have become available for ever wider strata of society. Health expenditures of countries has substantially risen as a consequence of the appearance of new technologies, ageing population and increasing requirements of the population, and an ever increasing rate of community resources are spent on financing healthcare costs.

Parallel to rising costs, there has been a growing claim, or rather constraint that allocating available funds should be

done not only with a view to arising medical professional claims but economic aspects also have to be taken into account. In the case of healthcare technologies (e.g. pharmaceuticals), three main criteria ("barriers") have been formulated according to the classic system of conditions: quality – 'first barrier', safety – 'second barrier', and efficacy – 'third barrier'. There is a well-constructed system of criteria to meet these three barriers in developed countries. However, in the course of financing decision-making, when decisions have to be made about available and usually relatively scarce resources, a fourth criterion, or "barrier" of effectiveness & cost-effectiveness has evolved.

In the course of the examination of the fourth "barrier", that is effectiveness and cost-effectiveness, financing organisations also want to know howeffectiveness is achieved by the given technology in routine clinical experience at what costs, in addition to efficacy information deriving from usual clinical trials (usually random control trials). Thus the principal role of this fourth "barrier" is to give a kind of scientific support for decision-making on funds allocation, its tool is the introduction of health-economic analyses.

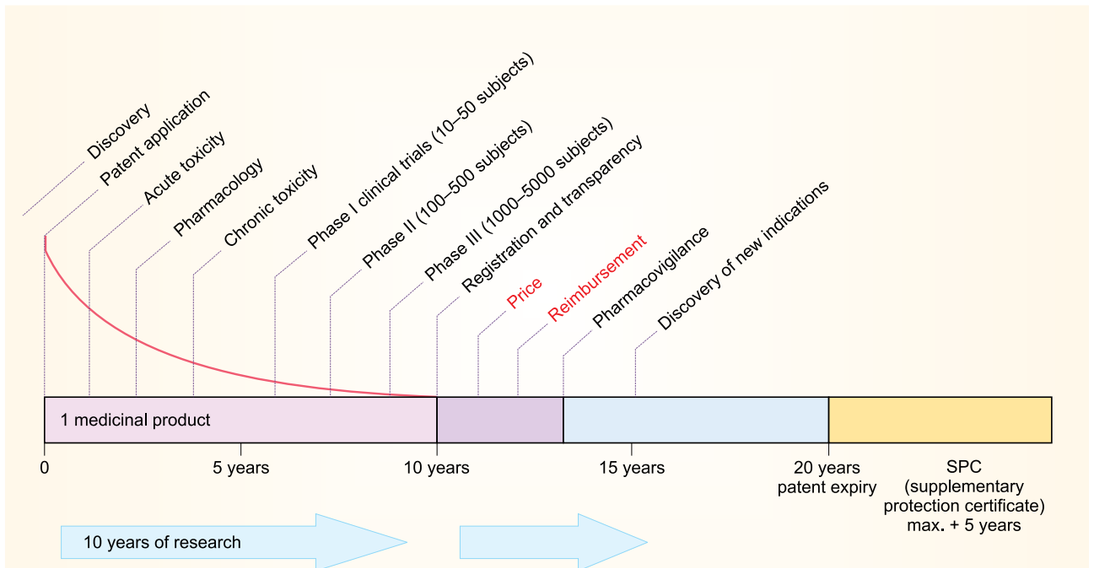
Health-economic and health technological analyses are gaining an ever greater role in many member states of the European Union (e.g. the United Kingdom, the Netherlands, Sweden, France etc.). NICE (National Institute for Clinical Excellence), a determining European institution of the profession, can be found in the United Kingdom.

In Hungary, the Health Ministry guideline to perform health-economic analyses was issued in 2002. This guideline determines the methodical issues of health-economic analyses, guaranteeing in this way the professional standards for the various analyses. The organizational background for health-economic and health-technological analyses has been guaranteed by Health Strategy Research Institute (ESKI, formerly Medinfo) since 2004.

Health-economic analyses have been included in public administrative decision-making since Hungary joined the European Union, first with the evaluation of social insurance reimbursement applications of pharmaceuticals, with naturalization of the so-called transparency directive (Directive 89/105/EEC of the Council of the European Communities on Transparency). The first domestic specialist books in the field of health economics have been written.

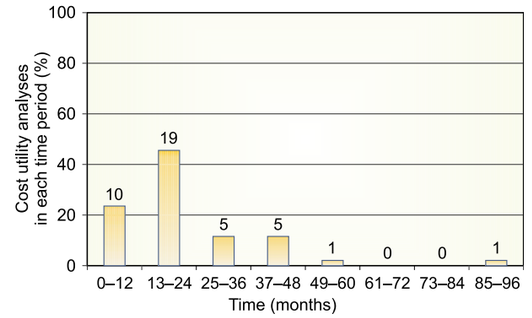
It should be emphasized that health-economic analyses are not a substantive tool in reducing healthcare costs, their role is to ensure comparison of alternatives arising in the course of approval decisions by social insurance.

Figure 11 illustrates the time of making/using health-economic analyses in the life cycle of pharmaceuticals. As can be seen, some ten years after the pharmaceutical has been developed, the following steps are registration, pricing, obtaining price support by social security. At this stage, the time period between registration/pricing and obtaining reimbursement from social security has great significance. The manufacturer or the trading licence holder is interested in the time between registration and obtaining social security reimbursement being as short as possible. If this takes up a long time (many years), the period protected by patent is significantly reduced and soon generic competitors appear.



2-10. ábra. Life cycle of pharmaceuticals from discovery (Source: Recherche & Vie, LIM, AGIM)

Figure 12 illustrates the average time period between the publication of clinical results and the publication of health-economic results of certain examinations (n=41). This delay is most often between 13–24 months in the examined cases. That is, the publication of health-economic results follows 13–24 months after the publication of clinical examination results.



2-11. ábra. The average time period (months) between the publication of clinical results and the publication of health-economic results of certain examinations (n=41) (Source: Greenberg D et al. BMJ 2004; 328:1536–7.)

Main types of health economic analyses

Cost analysis and cost of illness

During cost analysis, the focus is only on costs, the output indicators (effectiveness, efficacy) are not examined.

Cost-minimization analysis

The fundamental criterion of the use of cost-minimization analyses is that there should be no difference in the outcome of the examined healthcare technologies. Its typical field of use is in decision-making on pharmaceutical reimbursements when generic products appear in addition to original drugs (developed through innovative research) after patent protection expires. With regard to the fact that the agent molecule is the same both in the case of original and generic products, due to bioequivalence in most cases there is no difference in the outcome.

Thus here financing organizations (e.g. heathcare funds, state health service, or private health insurers) only take into account the price when the decision on reimbursement is made. In the course of agent-based fixing procedure, groups of the same agent are formed by the financer, then they render a fixed sum of reimbursement for the lowest priced product.

Table 14 Main types of health-economic analysesi

English name	Hungarian name	Outcome	Cost
Cost analysis (CA)	költségelemzés	Not examined	Comparative analysis of various cost elements and types (direct medical fees, indirect fees etc.)
Cost-minimization analysis (CMA)	költség-minimalizációs eljárás	No difference in the outcome of the examined procedures	Only the procedure fees have to be compared. The procedure of the lowest cost has to be chosen
cost-effectiveness analysis (CEA)	költség-hatékonysági elemzés	The same outcome indicator with regard to the different examined procedures (e.g. life years gained)	Cost/ life years saved
Cost-utility analysis (CUA)	költség-hasznosság elemzés	Both quantity and quality of the outcome is of interest (e.g. Quality adjusted life years, QALY; Disability adjusted life years, DALY)	Cost/QALY or cost/DALY
Cost-benefit analysis (CBA)	költség-haszon elemzés	The outcome of different naturalia is expressed uniformly in money.	Cost/cost

Cost-benefit analysis

This is the comparison between costs expressed in money of the examined healthcare programme or medical technology and the savings achieved through its implementation, or in other words the consequences expressed in money through omission of the programme. A severe difficulty is caused by the fact that in this method both the investment side and the outcome are measured in money.

Cost-effectiveness analysis

It is the comparative evaluation of two or more alternative procedures designed to achieve the same change in health condition, in the course of which the costs expressed in money are related to measurable requirements other than money (e.g. life years gained, non-occurence of death, illness-free days, extra years of an extended life, screened cases, etc.). During this analysis, two interventions which have the same outcome and the costs of which are known can be compared.

Namely, in the case of the examined procedures, the cost needed for a unit of outcome achieved is determined (e.g. cost/life years gained). It can be interpreted in the opposite way, (number of life years gained/ unit cost), which has significance in the case of a fixed budget.

Cost-utility analysis

The value of the use of a certain technology expressed as cost is related to achievable results in a way that the outcome is related to the number of quality adjusted life years (QUALY) gained after the applied technology.

That is, there are two procedures taken here but it is not only the change in the length of life that is measured, as with cost-effectiveness analysis, but also the change in the quality of life.

QUALY (Quality Adjusted Life Years) or the similar DALY (Disability Adjusted Life Years) can be used as a measure here.

Significance of scientific evidence in health-economic analyses

The significance of evidence-based medicine (EBM) became widely known in professional circles by the end of the 20th century. Throughout centuries of medical traditions, it has been a basic principle that individual experience gained through practice after long years of medical studies is significant. Personal experience, professional knowledge gained through healing are really indispensable for successful medical activity, however, more is needed in modern medicine.

There is a well-demonstrated correlation between the mode and effectiveness of medical practice. The primary role of evidence-based medicine is demonstrated in the fact that in a systematic form it reviews and analyzes day-to-day medical activity in terms of effectiveness. The techniques used in EBM are primarily public healthcare-type examinations (case control, cohort), randomized controlled trials (RCT) and systematic reviews of medical literature. Through these, an ever higher level of scientific evidence is reached, which help form clinical practice in a scientifically based way.

There have been several formulations of the hierarchy of scientific evidence, here the Oxford scale is presented in Table 14. It can be seen that the usual expert opinions and practical experiences are found at the lowest level (V). Case series constitute level IV. Case control studies and their systematic review can be found at level III. Cohort studies occupy level II of the hierarchy of scientific evidence. Outcomes from randomized controlled trials (Ib) mean the highest level of scientific evidence. If there are several RCT results available, the systematic review of these means the highest level of scientific evidence (Ia).

The health economic significance of evidence-based medicine (EBM) lies with the greater validity and reliability of health economic analyses based on good-quality, higher level scientific evidence. If doubts also arise in connection with the effectiveness of a healthcare technology (pharmaceutical, etc.), in this case the findings of health-economic analyses will also be difficult to interpret. Thus with health-economic and pharmaco-economic analyses, efforts must be made to base the analysis on as high level of scientific evidence as possible under the circumstances.

Table 15 Hierarchy of scientific facts – the Oxford scale

Category	Trials
Ia (A)	Evidence from systematic reviews or meta-analyses of randomized, controlled, double-blind trials
Ib (A)	Evidence from at least one randomized controlled trial
IIa (B)	Systematic review of cohort studies
IIb (B)	Cohort studies or lower-quality randomized controlled trials
IIIa (B)	Systematic review of case control studies
IIIb (B)	Case control studies
IV (C)	Case-series, or poor quality case-control, or cohort studies
V (D)	Expert opinion not supported by systematically and critically appraised data; for clinical practice, conclusions drawn from basic research results without clinical trials

The Structure of the Hungarian Healthcare System

Primary care

Primary care is the gate to the healthcare provider system, the organization of which may show variations across countries. There are three main types of general practitioner system models to be distinguished:

- Primary care versus specialty service system (GP-type)
- Settled specialists versus hospital (German-Austrian model)
- Three-level provision model (the Soviet model).

The borderline drawn between primary care and specialist care is essential in the GP-type model. The essential target is the definitive care for the population/patients within the framework of primary care, that is referral to the specialist care is avoided. In this system challenges are primarily met in primary care through strengthening the co-operation of physicians (group practice). Such a system is in operation in the United Kingdom.

With the German-Austrian type, the borderline is between outpatient care (that is, not outpatient specialist care) and inpatient care. By outpatient care all medical practice activities are meant when either a general physician or a specialist provides ambulant care within the framework of his practice. The aim is to avoid hospital care and provide definitive care within the framework of outpatient care. The Austrian and the German systems work according to this principle.

It is necessary to ensure some primary care in the neighbourhood of the patient (district physician) according to the classic superstructure of the Soviet model, the principles of the former Soviet Union. Farther from the place of living but still easily reached there is a specialist point of service which provides care (e.g. a polyclinic). Hospitals can be found at the third level here, too.

Of course, primary care does not merely equal GP activity. In Hungary, the main institutions and service providers of primary healthcare are the following:

- adult and child GP practices,
- primary dentistry care,
- on-duty care connected to primary care,
- health visiting care,
- school healthcare.

Outpatient specialist care

General outpatient specialist care is single or occasional care provided by a specialist on the referral of the doctor continuously caring or providing for the patient or on the patient's request, as well as continuous specialist care of the chronically ill not needing inpatient care. General outpatient specialist care must be ensured in a way that it can be reached by using public transport and the health condition of the patient is not threatened.

In Hungary, the following activities are included in outpatient specialist care:

- Specialist care facilities
- Specialist ambulatory care facilities
- Health centres
- Laboratory examinations
- CT-MR.

As a main rule, due to the "gatekeeper" role of the GP, a referral is needed to use outpatient specialist care, namely GPs have a patient-directing licence by means of which they can decide whether they are able to provide definitive care for the patient or they have to refer the patient to a specialist clinic for further examination/treatment.

There are exceptions to the main rule, that is, there are specialist care facilities that are available without a referral. These are the following:

- dermatology
- gynaecology
- urology
- psychiatry and addictions
- ear, nose and throat
- ophthalmology
- general and casualty surgery
- oncology.

Referrals can be given by the following physicians:

- adult and paediatric GPs (further referred to as GPs) and dentists with the aim of specialist consultation,
- the physicians at outpatient specialist care facilities – including health centres and genetic consultancies,
- physicians working in residential homes and rehabilitation centres for the mentally ill and handicapped, including physicians working in inpatient sanatoriums,
- physicians of school and youth healthcare services,
- physicians working for organizations led and directed by the minister in charge of law enforcement and the minister in charge of protection against disasters, and organizations directed and led by the minister in charge of national defence,
- physicians at penal institutions,
- recruiting physicians,
- physicians of experts' boards at medical experts' organizations,
- physicians of chief medical supervising officers' network of OEP (National Health Insurance Funds),
- physicians working for social-service residential homes providing personal care,
- physicians of the national sport healthcare network in their own scope of duties,
- physicians working for the National Tax and Customs Authority.

Inpatient specialist care

General inpatient specialist care is healthcare provision in the vicinity of the patient's neighbourhood within the framework of an inpatient institution. It is used, in accordance with a separate statute, on the referral of the physician providing continuous care for the patient, the therapist or another person entitled to do it, or on the request of the patient.

In the Hungarian healthcare provider system the following types of hospitals can be observed:

- general hospitals (city, capital, county hospitals)
- special hospitals
- paediatric hospitals
- rehabilitation hospitals
- university clinics
- national institutions.

There is a strict order of referrals in inpatient specialist care as well. Apart from those mentioned with outpatient specialist care, referrals to inpatient specialist care can be given by:

- therapists, determined in a statute, for home specialist care replacing inpatient healthcare institutional provision and hospice provision,
- exclusively a specialist qualified in treating the particular disease, or a GP on the specialist's initiation, for special services belonging to the scope of special home care services,
- the GP or the physician of the inpatient healthcare institution can refer the patient to institutional nursing with a healthcare provider contracted to finance chronic nursing,
- the insured patient can be referred to rehabilitation care by a doctor medically qualified in treating the disease necessitating rehabilitation, and by a specialist competent in possible complications connected to the disease, and the rehabilitation specialist or physiotherapist,
- the insured patient who is an addict can be referred to rehabilitation care – following the acute detoxification care – by a psychiatrist, addictologist or GP.

Progressiveness

In connection with establishing a progressive structure, the co-ordination of needs, capacities and financing is considered a cornerstone. A system can work efficiently, effectively, successfully and satisfactorily for the public, if tasks, responsibilities and required outcomes are synchronized.

The progressive structure comprised of primary care, inpatient specialist care, city and county hospitals and the Clinic Centre of universities is based on rational and fair division of labour. The base and first level of the structure is primary care. Creating the conditions for near-patient definitive care is of outstanding importance in order to strengthen primary care activity. Another key role is in prevention and early recognition of illnesses.

Outpatient specialist care is the second level of the progressive structure. It is still an emphasized aim to provide healthcare services outside inpatient care.

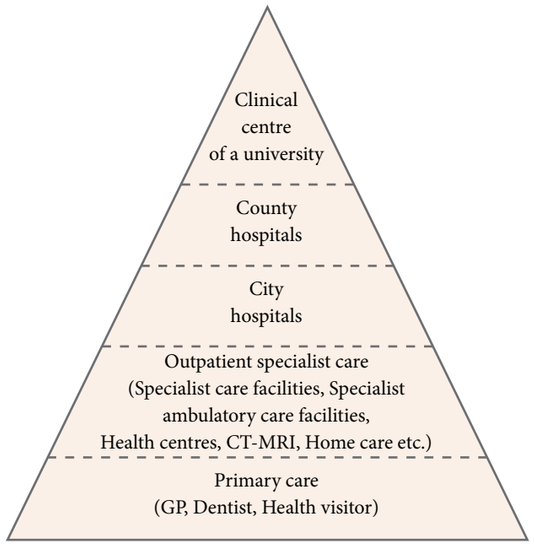


Figure 12 Progressive levels in the Southern Transdanubian Region

City hospitals constitute the first level of inpatient care, where ordinary healthcare interventions are carried out. City hospitals are the first step in providing care for inpatients in their area where they have a territorial supply obligation.

County hospitals are determinant actors in the county's provider system which take part in the care of patients sent from city hospitals in addition to providing healthcare for inhabitants who live in their own area where they have a territorial supply obligation.

Clinical centres of universities are at the top of progressive healthcare. Providing care for patients outside their own area is markedly present here. University clinics are places for patient care which needs a high-level professional qualification as well as a special technical background. Economies of scale have a determining role in their operation as well, as there are several interventions which are not worth being carried out in city or county hospitals due to the low number of cases.

Territorial obligation to provide specialist care

Territorial obligation to provide specialist care: the obligation of the maintainer or owner (hereafter maintainer) of the healthcare provider and the healthcare provider to provide healthcare services in specialist care in the area determined by law by using contracted specialized capacity for those entitled to have healthcare services of compulsory health insurance according to the contents of a special statute. The supply region is the geographical area where the healthcare provider and the maintainer have the obligation to provide specialist care.

Key terminology

Definitions of the key concepts used in the description and presentation of our healthcare system are provided below primarily according to the contents of the Act LXXXIII of 1997 on the Provisions of Mandatory Health Insurance, Act CXXXII. of 2006 on the Development of the Healthcare Provision System, and the Act XCVIII of 2006 on the General Provisions Relating to the Reliable and Economically Feasible Supply of Medicinal Products and Medical Aids and on the Distribution of Medicinal Products.

- *public healthcare service:* healthcare service partially or totally financed from the central budget and the Health Insurance Funds;
- *organization in charge of public healthcare service:* health maintainer/owner of the healthcare provider which possesses contracted capacity;
- *contracted capacity:* specialist-care capacity according to point i) for which there is a valid financing agreement;
- *office hours:* hours financed by the healthcare insurer within the social security framework;
- *emergency care:* according to point i), para. 3 of the act on healthcare it includes examinations to find out if an urgent need has arisen, and healthcare service involving interventions to avert the urgent need;
- *specialist-care capacity:* specialist and non-specialist hours in outpatient specialist care, financed units of one-day healthcare service, number of beds for active and chronic provisions in inpatient care; any other financed units of service prescribed in a statute including CT, MRI, PET/CT and other tools regulated in a separate statute, the financed units of service of kidney dialysis treatment;
- *main specialities:* internal medicine, paediatrics, surgery, obstetrics and gynaecology;
- *specialty centre:* organizational unit or section of an institution with specialized responsibilities where regional or cross-regional tasks are carried out;
- *healthcare provider:* a natural or legal person or unincorporated organization entitled to provide healthcare services under specific other legislation;
- *pharmacy:* a pharmacy under the effect of Act XCVIII of 2006 on the General Provisions Relating to the Reliable and Economically Feasible Supply of Medicinal Products and Medical Aids and on the Distribution of Medicinal Products,
- *medicinal products:* any product as defined in Point 1 of Section 1 of the Act XCV of 2005 on Medicinal Products for Human Use and on the Amendment of Other Regulations Related to Medicinal Products and dietary supplements for special nutritional needs,
- *therapeutic provision:* provision determined in the regulation on reimbursed therapeutic provisions with the aim of medical rehabilitation,
- *close relative:* spouse, common-law wife/husband, direct relative, adopted child, stepchild, fosterchild, adopting parent, stepparent, foster parent, brother and sister,
- *central waiting list:* list of patients waiting for the use of high-cost provisions defined in a separate statute, as well as the list of patients waiting for transplantation of organs or blood-cell producing stem cells (tranplantation waiting list),
- *institutional waiting list:* the list determining the order of patient care in the given inpatient care institution, which – apart from the provisions that can be used according to the central waiting list – are formed in order for healthcare provisions to be performed in a determined order, as well as in the case of long lack of capacity (points j) and k) are: waiting list hereafter),
- *patient admission list:* the list of the order of patient care by designated time of use per specialist consultation – if the insured patient's condition does not need immediate care – in the given outpatient specialist care institution,
- *trial purchase:* on-the-spot checking by the health insurer during which the person performing checking assu-

mes the role of buyer or user of a service – with the exception of therapeutic-preventive healthcare provision,
- *healthcare technology used in the course of therapeutic-preventive procedures:* activities to preserve, restore health and diagnose health status, and all the tools, materials used in connection with this not including the use of those medications and medical aids that are subsidized from the Health Fund which can be ordered on prescription and reimbursed;
- *medicinal products with public financing:* medicinal products and dietary supplements for special nutritional needs, whose prices are subsidized under specific other legislation from the central budget or by the Health Insurance Fund (hereinafter referred to as "H. Fund") to those eligible;
- *medicinal products with special funding:* medicinal products for which subsidies are provided under a public contract between the health insurance administration agency and the manufacturer/distributor/supplier in accordance with specific other legislation;
- *marketing authorization:* an official decision issued by the authority of competence and jurisdiction authorizing a certain medicinal product for human therapeutic use;
- *marketing authorization holder:* a natural or legal person or unincorporated organization, to whom the competent authority has granted authorization for the marketing of a specific medicinal product;
- *medical aid:* any medical device made available for personal use to patients suffering in a temporary or persistent disability or incapacity (including in vitro medical devices with diagnostic facilities for self-inspection purposes), and other technical devices for nursing purposes, which are not treated as medical devices, designed for use without the continued presence of a healthcare professional. Personal use means where the medical aid is worn, applied in body cavities with exterior opening, whether natural or artificial, or on the body, and the use of equipment for supporting or moving the body for diagnostic purposes or for the purpose of therapy, rehabilitation or nursing;
- *therapeutic preparations which are not classified as medicinal products:* a substance or compound which is not treated as a pharmaceutical product, but which has been registered by the authority of competence and jurisdiction with authorization granted for marketing designated as a therapeutic preparation which is not classified as a medicinal product;
- *inexpensive gift:* any benefit provided in kind whose value including value added tax, or failing this, its purchase price or production cost including value added tax is less than 5 per cent of the prevailing monthly minimum wage;
- *persons qualified to prescribe or supply medicinal products and medical aids:* physicians, pharmacists, manufacturers and traders of medicinal products and medical aids holding the appropriate authorization and engaged in their commercial distribution;
- *ATC-group:* the system of classification of medicinal products according to anatomical, therapeutic and chemical actions;
- *reference medicinal product:* the medicinal products in a specific (fixed) subsidy group, for which subsidy is provided at a specific percentage fixed for the ATC-group in question based on its gross retail price as defined in specific other legislation and its market share;
- *reference medical aid:* the medical aids in a specific (fixed) subsidy group – other than the medical aids of a specific function group which are contained in the simplified list of subsidized products, and those subsidized under the three-month therapy limit (fixed sum) –, for which subsidy is provided at a specific percentage fixed for the subsidy group in question based on its price as defined in specific other legislation serving the basis for public financing, its rental fee and market share;
- *public pharmacy:* a full-service health-care facility that is engaged in supplying medicinal products directly to the general public, including the preparation of magistral formulas within the framework of full-service operations;
- *branch pharmacy:* a health-care facility that functions as the satellite of a public pharmacy, or operated as a mobile unit and is engaged in supplying medicinal products directly to the general public;
- *institutional pharmacy:* a full-service health-care facility installed in an inpatient institution for supplying medicinal products to that institution, which is also engaged in supplying medicinal products to the general public as well as a specialist activity;
- *dispensing pharmacy:* a method of supply of specific medicinal products needed for therapeutic work by general practitioners and general paediatricians (hereinafter referred to as "general practitioner");
- *independent pharmacy operation right:* an authorization granted to an experienced pharmacist to manage and operate a public pharmacy (hereinafter referred to as "independent right");
- *consultation by pharmacist:* an activity performed –and documented - by pharmacists on a voluntary and prudential basis, aiming to improve – in collaboration with the doctors affected – the efficiency, reliability and cost-effectiveness of treatment using medicinal products, and to promote the education of patients for better health awareness, to provide technical assistance for the administration of medicinal products, for improving their disposition to cooperate and to improve their quality of life, in a controlled environment;
- *official manager:* a pharmacist appointed by a regulatory decision for the temporary operation of a public pharmacy;

- *subsidy group:* a group of products which are subsidized at a specific (fixed) sum determined based on the percentage rate fixed for the price of the group's reference medical aid.

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3. The Hungarian and International Attributes of Legal Health Care Regulation

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Historic Overview

The right to health as a basic constitutional right. The highest level legal source of our country, Act XX of 1949 on the Constitution of the Republic of Hungary lays down the right to physical and mental health[1] and also the right to social security[2]. Other than declaring these rights, this law also names the institutional systems which guarantee the realization of these rights.

Additionally the consequences of which we begin the investigation of the questions related to the legal regulation of health care. There are two main areas that have to be considered systematically.

- The formation and development of the regulations concerning healthcare institutions and provision
- In relation to social insurance, parts of which are assocatied with illness and healthcare insurance[3].

The Development of Regulations Concerning Healthcare Institutions and Provisions

In Hungary the tradition that intends to summarize the norms related to health care in one single enactment, in a so-called codex, can be traced back to 1770. In general these rules of law define the systematized functional frames for public health care, called national health today and also for healthcare services and have dealt with the emphatic regulational domains of the given era respectively.

Our national legal system created four such codices in the last centuries which are as follow:

"Generale Normativum in Re Sanitatis" of 1770 which came into being at the beginning of the civilian development evolving from the feudal system,

Section XIV of 1876 on the adjudication of public health care, the product of classical civilian legislation

Act II of 1972 on Health, the imprint of the socialist era between 1949 and 1989 both in an ideological sense as in an organizational functioning sense,

Act CLIV of 1997 on Health[4].

The Evolvement of Legal Regulation Concerning Social Security[5]

Generally financial provisions play a significant role in social insurance systems. Provisions in kind (in naturam) are primarily justified to be organized at areas where either market mechanisms do not function properly or monetary provisions may be sources of misuse or they are not used appropriately. Medical provision, hospital care, the provision of medicine and other supplementary medical appliances can typically be considered of such an issue. As a result of the shortcomings of the health service system social insurance would vainly supply financial resources for the ones needing them since it is not certain that the person in need of treatment could attain each necessary healing provision from these resources (even if their amount is theoretically sufficient). Due to this, social insurance is almost forced to sac-

[1] *70/D. Section* (1) People living in the area of the Republic of Hungary have the right to the highest possible level of physical and mental *health.*
(2) This right is realized by the Hungarian Republic via labour safety, *the organization of healthcare institutions and medical care,* ensuring regular physical training and by the protection of the built and natural environment.

[2] *70/E. Section* (1) The citizens of the Hungarian Republic are entitled to *social security;* to provision necessary for their subsistence in case of *old age, illness, disability,* widowhood, orphanhood and unemployment, the latter having occurred through no fault of their own.
(2) The Republic of Hungary realizes the right to provision *via social insurance* and the system of social institutions.

[3] See also Kovácsy, Zs. pp 4–5.

[4] See in details: Balázs, P., Sztrilics, A. pp 20–33.

[5] In this part the evolvement of illness insurance which constitutes part of social insurance is roughly outlined focusing on the provisions in kind.

rifice significant sums of money to supplement the medical care network and create medical institutions, convalescent hospitals from the contributions mainly originating from the insured ones and employers[6].

In Hungary the beginning of the development of the social insurance system operated by the state dates back to the last decades of the 19th century when the German and the Austrian example was followed. In 1891 the parliament of the time passed Section XIV of 1891 on the mandatory illness insurance of industrial and factory employees. This can be considered as the first step on the path that led with significant alterations to our present-day social insurance system during long decades.[7]

Section XIV of 1891

Passing the section brought a fundamental shift in the development of workers' insurance. This was the first act that ordered the organization of healthcare provision for the people in question, in the area of illness insurance based on the principle of mandatory insurance. It enacts about two groups of protected individuals, namely about the ones entitled to mandatory protection (employees employed by companies that come under the ruling of the Act of Industry[8] i.e. workers at larger constructions, people working for railway, shipping and shipbuilding companies, carriers, freighters etc.) and the ones who get under protection on the basis of voluntary membership (e.g. workers hired for less than eight days, independent craftsmen, artisans, the relatives of the latter etc.). The funds provided the insured ones with free medical treatment and medicines[9].

Section XIX of 1907

It came into being to eliminate the shortcomings of the first law on mandatory illness insurance. Its two main rulings are the expansion of the range of the insured ones and creating insurance referring to accidents. Within the frame of accident insurance free medical care, medicines and medical appliances were provided.[10]

Section XXI of 1927

The section was passed as a result of the further development of illness insurance. The circle of the insured ones was slightly expanded once more (lawyer's offices, physician's surgeries, chambers of commerce and advocates etc.) just as the extent of provisions allowed to be claimed. In the case of diseases, the time period for demandable medical treatments, medicines and medical appliances was raised to one year and the wife of an individual with insurance was also entitled to claim the healthcare services and therapies necessary for childbirth. Independent of the insured time interval, the already outlined healthcare provisions were assured in the case of accidents.[11]

By 1939 illness insurance spread to almost one and a half million people (the majority of the 1.9–2 million people not employed in agriculture at the time).

Illness Health Insurance after 1945

In the development of the healthcare system after 1945 three phases can be distinguished which substantially differ from one another.

The nationalization of healthcare institutions began from *1945 onwards* which sped up after the year of shift???what does this mean? and by 1950 the whole of the healthcare network was brought under state control; its development and maintenance became the task of the state. The state took over the healthcare provision of employees and industrial workers from the National Social Insurance Institute. After 1961 the essentially free health provision of the cooperative peasantry also became the duty of the state.

It is typical of this era, especially of its initial phase, that the number of individuals *eligible* for healthcare services *increased* substantially. While in 1938 exactly 31% of the population was insured, by the end of 1966 the number of rightful claimants, including the retired, reached 9.9 million this equated to 97% of the country's population at that time.

Between 1945 and 1975 the given healthcare *services* typically provided *physicians' (specialists') treatments, medicines, thermal spa treatments, medical appliances and ambulance transportation* for workers involving members of agricultural cooperatives and their family members as long as their medical status made it necessary (with no time limitation).

From mid-1975 onwards, health care provision was entailed *by the right of citizenship.*[12] Medicine, medical appliances and providing false teeth were implied by the right of citizenship but for a pre-determined charge.

Health services have become *insurance based since 1990* again. However the majority of the population is entitled to healthcare services, eligibility being regulated in terms of the specific provisions.[13]

[6] See in details Czúcz, O. pp 205–206.

[7] Czúcz, O. 66 p.

[8] Act XVII of 1878

[9] See in details Czúcz, O. pp 69–71.

[10] See in details Czúcz, O. pp 71–73.

[11] See in details Czúcz, O. pp 74–76.

[12] Based on Act II of 1972 on Health beginning from 1st July 1975 "citizens are entitled to free medical treatments within the framework of the healing-preventive provision, including hospitalized treatments, obstetricians' care and transportation by ambulance". Decree No. 17/1975 (June 14) Section 354 on the enforcement of Act II of 1975 made Section 25 on the eligibility of health provision based on citizen's rights take effect.

[13] Czúcz, O., Hajdú, J. , Pogány, M. pp 12–14

Today's Mandatory Health Insurance System

Out of the provisions provided within the framework of the social security system, health service is the form in kind concerning health insurance provisions. The scope of the eligible persons and the funding of the provisions is regulated by the *"Act LXXX of 1997 on the Eligibility for Social Security Benefits and Private Pensions and the Funding for These Services".* In terms of health services the scope of protected persons are the insured persons (Section 5) and the ones eligible for healthcare services (Section 16).

The provisions provided as healthcare services are laid down in *"Act LXXXIII of 1997 on mandatory health insurance".*

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International Outlook

Social Rights

According to systematic rights, eligibility and provisions are placed within the framework of social rights in Hungary.

In the scope of human rights, economical, social and cultural rights are called *secondary generational basic rights***.** These rights became laid down gradually in different aspects of legislation. Their acknowledgement as guaranteed basic rights occurred only in the second half of the 20th century. These rights are fundamentally distinguished from the primary generational rights i.e. from the rights to liberty (freedom of religion, freedom of speech etc.) by some active intervention of the state being necessitated for their realization whereas in case of the rights to liberty the recession and non-interference of the state will oblige.

The declaration of the guarantees for human rights were first acknowledged on the 10th December 1948 within the *"Universal Declaration of Human Rights"* which develops the fundamental rules and rights to liberty including civil, political, economical, social and cultural rights in 30 articles for every human being.

Article 22 proclaims that every person, as a member of society, is entitled to social security.

Article 25 points out that every person is entitled to the standard of living assuring his own and his family's health and well-being, namely food, clothing, housing, medical care and the necessary social services. They have the right to insurance when in case of unemployment, illness, disability, widowhood, old age or in all other cases when independent of their will, the means of subsistence are lost.

The *International Covenant on Economic, Social and Cultural Rights* was declared in 1966. It has been in force since 1976.

- I. The stated rights include:
- II. The right to work (Articles 6 and 7)
- III. The right to social security (Article 9)
- IV. The right to the protection of family (Article 10)
- V. The right to adequate standard of living (Article 11)
- VI. The right to education (Article 13)
- VII. The right to health (Article 12)
- VIII. The right to join trade unions (Article 8)

The *European Social Charter* defends the right to social security via several articles constituting a system. It is a Council of Europe International Treaty, opened for signature in 1961. This legal document of outstanding significance contains social and economic rights in a stand-alone synchronization. It came into force in 1965 with the ratification of the 5th state. [14]

Article 12 lays down the right to social insurance, Article 13 the right to providing social and healthcare aid, Article 14 the right to participation in social welfare services, Article 16 the social, legal and economic protection of families, Article 17 mothers' and children's right to social and economic protection and the obligations of the state related to these. Hungary ratified the majority of the articles.

In the *European Union* the responsibility related to the social security systems and making the institutions function stays almost exclusively in the member states' sphere of authority. The reason for this is that the social law of the individual member states contains numerous unique elements, typical only of them. With regard to public aims these various member state laws can be harmonized with coordination. The coordination is manifested with decrees, the most significant ones being from the point of view of our topic are the *Decree 1408/71/the Council of the EEC and the Decree 574/72/the Council of the EEC.*[15] These are the so-called secondary community

[14] Gyulavári – Könczei p 199

[15] See in details: Gyulavári, T. Chapter 3

norms which are typically of an obligatory force in their totality and they are rules directly in force in each member state.[16]

The *First Social Action Programme* passed in *1974* was the result of the Committee's consultancy and preparatory work which started in 1971.

Although the contract did not ordain the creation of a social programme, the Committee deemed the creation of the Action Programme necessary in order to effectuate the political decisions of the Parisian Summit. This was passed in the form of a proposal which is a document not bearing a legal obligatory force.

- Its three main goals are as follow:
- improving the employment situation,
- improving life and work conditions,
- the creation of a widespread dialogue in terms of the communities who make economical and social decisions.[17]

Due to the Action Programme **social law harmonization** began in the second half of the 1970s, the means of which are the **directives.** This is such a legal source of the secondary right of the community that defines the goals to be achieved but it charges the member states with the methods and means of execution.

Regulation Concerning Working Hours, the Working Hours Directive

It was based on Article 118/a (into force Article 138) of the Treaty of Rome which was inserted into the contract by the Single European Act. The article ensured such a sphere of authority for the Council that it should vote the minimum requirements with directives for improving work conditions in order to protect the security and health of employees. Based on this Directive 93/104/EC on certain questions of organizing working time was passed.

The working time directive (the 2003/88/EC of 4 November 2003 of the European Parliament and Council on certain aspects of working time organization) was passed in its original form in 1993 and has been modified several times since then.

The Free Flow of Manpower in the European Union

According to Article 1 of Decree No. 1612/68/EC of the Council the citizens of the member states, regardless of their place of living, are entitled to take a job and do a job in the territory of another member state according to the legal, regulation or administrative orders regulating the employment of the citizens of the member state in question by law. In the territory of another member state they are especially entitled to take jobs under the same conditions as the citizens of the given state.

The decree contains strict rules regarding the prohibition of foreigners' employment limitation; the limiting member state regulations cannot be applied.

Other than regulating residence and employment rights, the Community helps the free flow of manpower via three means. They are as follows:

- social security coordination
- the mutual acknowledgement of degrees and qualifications
- the system of informing employees (EURES)

Patients' Rights

Since the effectiveness of patients' rights bear a distinguished role from the point of view of the quality of health services and within this the quality of nursing activities, the international legal sources are outlined.

Specific countries considering the general or the detailed regulation of patients' rights depends on manifold circumstances.[18] We do not undertake the detailed description of these regulations but a few dates of year which are considered milestones in law protection, are highlighted in the chart below.

Two declarations of the above had an extremely significant influence on Hungarian healthcare legislation.

WHO Declaration on the Promotion of Patients' Rights

WHO i.e. the World Health Organization of the UN – A Declaration on the Promotion of Patients' Rights, Amsterdam, March 1994

It came into being as a result of the WHO Conference held in 1994. On the request of the European Parliament the European Regional Office of the WHO prepared the draft for the international document which lays down the basic principles of patients' rights. Subsequent to the discussion of the European tendencies and practical problems of healthcare legislation at the conference, 36 European countries accepted the document which has been serving as the most important guideline for legislation ever since.

Agreement on Human Rights and Biomedicine

Council of Europe – Agreement on the protection of human rights and dignity regarding the application of biology and medical sciences, Oviedo, 4 April 1997.

The bioethical Convention became the frame agreement for bioethical principles after almost seven years of preparatory work. The member states of the Council of Europe, other invited states and the representatives of the European Union accepted and signed the international document. The signing countries, Hungary, notably being one of them, took the responsibility that they insert the requirements passed in the Convention to their own legal system.

These documents were taken into consideration by legislation upon the codification of Act CLIV of 1997.

[16] Czúcz, O. p 324

[17] Source: http://moodle.disabilityknowledge.org/mod/glossary/view.php?id=355&mode=&hook=ALL&sortkey=&sortorder=&fullsearch=0&page=31

[18] Mikko, V.: pp 17–29

Chart 1 Law Protection: International and National Milestones Source: Mikko, V. p 18

Year	Event
1944	Proposal on Medical Care – *passed by the International Labour Organization (Proposal 69, Section IV – Philadelphia)*
1948	Universal Declaration of Human Rights – *passed by the UN General Assembly*
1973	List of Patients' Rights – *published by the American Hospital Association*
1974	Patients' Rights and Obligations of a Charter – *published in France*
1974	Hospital Patient Charter – *published in France*
1976	Proposal for the Sick and Dying People's Rights – *passed by the Parliamentary Assembly of the Council of Europe's*

The Newest Regulation Regarding Patients' Rights[19]

The European Parliament (EP) voted for the EU directive on patients' rights on the 19th January 2011. Subsequent to this the Council, under the chairmanship of Hungary, may accept the text as final. The basic principle of the definite regulation ready for the approval of the council is that patients are entitled to as much refunding of expenses in the country providing health care as they would receive if they were treated in their own country. This means the practical realization of the "free movements of patients" which demands coordination among the 27 different health and social security systems of the 27 member states. The directive created the system of this collaboration among the member states. The detailed regulation takes measures about the accounts rendered among the member states and ensures that patients are provided with exact information about the quality of the available health care services in the given countries.

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Legal Aspects in Health Care Provision Based on Act Cliv of 1997 on Health

In higher health care education the professionals receiving qualifications for practising their profession must be capable of providing health care according to the level of their qualification. However, the legal background of their profession, the knowledge and skilled application of its legal system of rules are indispensably necessary for accomplishing these tasks fully at an appropriate level considering that such processes have been going on in the area of health sciences all over Europe that made health care professionals, provision sponsors and the population face challenges never seen before.

The current enforceable act, *Act CLIV of 1997 on Health* was created in order to ensure the rights connected to healthcare provision.

Regarding the *force operation*[20] of the act it refers to

- the natural persons residing in the territory of,
- the healthcare service providers functioning in the territory of,
- the health activities performed in the territory of the Republic of Hungary.

The decrees of the act must be properly applied also regarding the healthcare services provided by the social institutions that provide personal care.

The act gives an opportunity for another law to create rules differing from the ones included in the act on health regarding certain natural persons (e.g. in case of people kept as confined).

[20] Act on Health Section 4, Subsections (1) to (3)

Legislation defined that the *purpose*[21] of this Act is

- to foster the improvement of health of the individual, and thereby, of the population, by determining the system of conditions and means influencing health as well as the responsibilities of those involved in the establishment thereof,
- to contribute to ensuring equal access to health care services for all members of society,
- to create the conditions whereby all patients may preserve their human dignity and identity and their right of self-determination and all other rights may remain unimpaired,
- define the general professional requirements and guarantees of quality of health services, regardless of the legal status of service and the funding of services,
- to ensure the protection of health workers and health care institutions by defining their rights and obligations and through safeguards arising from the peculiar nature of health services,
- to enable that individual and community interests may be asserted in harmony, current public health objectives may be attained, the required funding may be available and deployed in an optimal way and health sciences may continue to develop.

In addition to the purposes and detailed definitions, Act CLIV of 1997 on Health laid down some *fundamental principles*[22] which are as follows:

- In the course of delivering this Act the rights and dignity of the patient shall be protected.
- Regarding the points of view of the patient it shall be required to enforce equity throughout the utilization of healthcare services.
- In the functioning of health care the primary means of improving health are to promote health and to prevent disease.
- Applying the principle of progressivity in the structure of the health care system bears outstanding importance.
- The professional requirements of providing healthcare services are neutral in terms of sectors.

The protection of patients' rights and dignity possess a distinguished significance under guarantee among the fundamental principles. The patients' personal freedom and right of self-determination are exclusively justified by their health status and they can be restricted in the cases and in the manner defined in this Act. Upon the enforcement of this limitation the method and degree of restriction always has to be proportionately in accordance with the purpose to be protected i.e. with the significance of public interest (e.g. epidemiological security, the protection of patients' physical integrity and health and the protection of their environment).

Legal references

Act XX of 1949 on the Constitution of the Republic of Hungary
Act CLIV of 1997 on Health

Patients' Rghts in Act Cliv of 1997 on Health

The Importance of Patients' Rights[23]

Citizens must not lose any of their rights just because their state of health has changed. Moreover, their human rights require increased protection since due to their disease they have become more defenceless. The Constitution, as a basic law, the norms of the Act on Health and the Civil Code ensure the protection of those individuals' rights who get in touch with the health care system.

The declaration of patients' rights by themselves does not ensure the automatic assertion of patients' rights. For this purpose creating legal institutions is required which are to provide aid in the effectiveness of laws and initiate appropriate legal remedy in case of legal grievances.

Our new constitution, i.e. the Basic Law of Hungary comes into force on the 1st January 2012. Its Article XX says briefly in Section 1, that everyone is entitled to physical and mental health. Section 2 discusses a variant of it when it declares that the assertion of the above right is fostered by Hungary by also the organization of health care provision.

The concept of a patient is defined by the Act on Health, according to which a patient is a person using or receiving healthcare services.

Consequently it is not only an individual whose health is impaired who can receive and does indeed receive the services provided by the health care system but it refers to a wider aspect of healthcare examples of which are. screening examinations, preventive care, aesthetic interventions etc.

Patients' rights do not only refer to patients but in certain cases to their relatives, heirs or heiresses. Besides, patients' rights are independent of citizenship, potential insurance legal terms, just as the force operation of the Act on Health also comprises natural persons residing in the territory of the Republic of Hungary, the health care providers operating here and the healthcare activities pursued by them. Furthermore, legislation also includes the operational force of the Act referring to health care services delivered by social welfare institutions providing personal care.

[21] Act on Health Title 1 Section 1

[22] Act on Health Title 1 Section 2 Subsections (1) to (5)

[23] See in details Polecsák, M. pp 27–29, See also Kőszegfalvi, E. p 91

The Right to Health Care[24]

The right to health care is a general definition which is filled with content by further parts of the Act.

The Act on Health guarantees the following rights to each patient:

- the right to receive, in an emergency, life-saving care or care to prevent serious or permanent impairment to health;
- the right to have the patient's pain controlled and his suffering relieved;
- the right to health care justified by his health condition;
- the right to appropriate healthcare services which have to be of the highest level available among the given objective circumstances. Healthcare is considered appropriate if delivered in compliance with the professional and ethical rules and guidelines;
- the right to continuously accessible health care i.e. the operation of the health care delivery is such as to enable its use 24 hours a day;
- the right to equal healthcare service i.e. to healthcare which is free from discrimination;
- the right related to freely choosing the attending physician and the medical institution, the limitation of which is the health care providers medically justified availability or if the choice is not precluded by the professional contents of the health service justified by the patient's condition, by the urgency of care or the legal relationship serving as the basis for the use of the service;
- the right to be informed about the healthcare provider ensuring appropriate care;
- the right to be placed on a waiting list.

Within the right to health care there are also existing restrictions about receiving justified care and freely choosing the attending physician (professional competence, the operational order of the healthcare providing institution, territorial restrictions, interventions to be paid for, loaded state/waiting list, the right to deny care as it is written in Section 131 of the Act on Health etc.). The right to refuse healthcare from the doctor's part is an option in certain cases or an obligation in other instances.

A physician may refuse to examine a patient seeking care

- if prevented from doing so because of the immediate need to care for another patient or
- because of a personal relationship with the patient;
- if the given treatment is in conflict with the physician's moral outlook, conscience or religious convictions;
- if the patient seriously violates his obligation to cooperate;
- if the patient behaves in a manner that insults or threatens the physician, unless this behaviour can be attributed to the disorder;
- if the patient's behaviour puts the life or physical well-being of the physician at risk.

In these cases the patient has to be referred to another physician.

A physician may refuse to provide care for a patient only following an examination if he determines that

- the patient's health status does not require medical care;
- the treatment requested by the referring physician or the patient is not justified professionally;
- the healthcare provider does not have the personnel or objective conditions needed to provide the care and he refers the patient to a professionally responsible healthcare provider;
- the condition of the patient does not require immediate intervention and the physician orders the patient to return at a later time or the intervention is professionally not justified.

A physician compulsorily must refuse care

- if he is physically unfit to provide it because of his own state of health or other obstacle,
- if based on the patient's examination it can be determined that the treatment requested by the referring physician or the patient conflicts with statutes or professional rules.

The Right to Human Dignity[25]

In the course of health care, the patient is entitled to be treated with respect and honour, his rights related to him as a person must be respected. In the course of health care, only the interventions necessary for the examination and medical care of the patient may be performed.

In the course of health care, a patient may be restricted by physical, chemical, biological or psychological methods and procedures exclusively in case of emergency, or in the interest of protecting the health of the patient or others.

In this case the application of restrictive methods or procedures shall be exclusively ordered by the patient's attending physician or in exceptionally justified cases, a registered specialist nurse may also give temporary order for the restriction.

One of the big problems of the contemporary Hungarian health care system from the patients' part is waiting, which is drawn into the conceptual sphere of the right to dignity by legislation, when it says that a patient may only be made to wait on grounds and for a duration which are reasonable. The case with a fractured leg, reviewed in the first part must be referred to at this place again.

[24] Act on Health Sections 6 to 9

[25] Act on Health Section 10

The exposition that in the course of health care, for protection of his modesty, the patient's clothing may only be removed for the necessary time and to the professionally justified extent became part of this Act also with the development of patients' rights. This issue is dealt with in more details by the Health Care Ministerial Decree 30/2007 (22 June) on the regulation of healthcare workers.

The Right to Have Contact[26]

The right to have contact may be exercised by the patient according to the hospital regulations existing in the in-patient institution, while respecting his fellow-patients' rights and thus ensuring health care to be undisturbed.

Regarding a patient in a severe condition, a minor, a woman in childbirth and her newborn baby, the Act ensures more rights for them than general regulations do. In the first two cases it is based on subjective right that patients are assured to have contact with close relatives, whereas in the third case it refers to a continuous contact between the mother and the baby.

- A patient is in a severe state when due to his condition he is incapable of physically taking care of himself, or his pain cannot be relieved with medication, or he is in a crisis situation.
- A minor is a person under the age of 18 who has the right to have his parent, legal representative or a person designated by him or by his legal representative stay with him.
- A woman in childbirth shall have a right to designate a person of age to stay with her continuously during labour and delivery, and after delivery, to have her newborn baby placed in the same room with her, provided it is not excluded by the mother's or the newborn baby's health condition. As a result of this the number of deliveries with fathers or grandparents present has increased significantly by nowadays, which, along with the spread of alternative childbirths, has transformed the methods of labour and delivery. Naturally the regulations of the hospital, the time limitations of visiting patients must be kept. The hospital may define the number of visitors a patient may have at a time, in cases when there is reason for it, the hospital may prohibit visitation or may order epidemiological arrangements visitations by children may also be restricted.

The patient having the right to keep contact with a representative of the church in compliance with his religious convictions and, in general, freely practise his religion are of high priority.

As a further major rule the patient is also entitled to use his own clothes and personal belongings.

The patient's right to self-determination also includes that with an expressed disposition the patient may forbid the institution delivering his health care to give information about him to anyone or to publicly display where he is placed.

[26] Act on Health Section 11

The Right to Leave the Healthcare Facility[27]

The patient has the right to leave the healthcare facility, unless he threatens the physical safety or health of others by doing so. In the case of an incapable patient this right may be exercised with the agreement of the legal representative. (A parent, a guardian, or a trustee, who can be a legal representative.)

If required by the patient's condition, the competent authorities have to be notified about the fact that the patient has left the healthcare facility. In case of an incapable patient the legal representative must be notified.

All in all a patient must be aware of the risks they subject themselves to by leaving the healthcare facility. Once the patient has been fully informed about the risks this dialogue must must be documented fully in the patient's records.

The Right to Information[28]

Exercising the right to be provided with information is a prerequisite for the appropriate effectiveness of the right to self-determination. Pursuant to this the patient has the right to receive information on their state of health in a general sense and on a continual basis.

The patient has the right to complete information about every essential circumstance, provided in an individualized form before starting certain interventions because proper familiarity constitutes the basis for the patient's decisions concerning his health status. The patient has a right to be informed even in cases where their consent is not otherwise a condition for initiating medical care. Informing the patient primarily has to involve their right to consent to or refuse a medical intervention. The patient has the right to pose additional questions during information and subsequently, besides they have the right to know the identity, qualifications and professional status of those directly providing services.

The patient has to be informed in a way which is comprehensible for them, with regard to their age, education, knowledge, state of mind. If necessary, the services of an interpreter or a sign language interpreter must be supplied for the provision of information as well ensuring consent is fully understood.

A capable[29] minor who has already turned 16 years of age[30] may waive the right of being informed, except in cases when they must be aware of the nature of their illness in order not to endanger the health of others.

In this part of the Act one of the most commonly applied, argued about and due to its potential shortage, protested law is discussed. According to the ministerial reasoning added to the Act on Health, the right to be provided with information is the prerequisite for the appropriate effectiveness of the right to self-determination.

All the scientific literature, may it be a case collection of the rules of court[31] or scientific literature on medical compensational responsibility,[32] it dedicates its major part to this right, since practically if there is a debate between the healthcare facility and the patient, this right almost certainly is stressed may the debate be the result of not keeping either the moral or the legal norms.

As we have referred to it earlier, it is of utmost importance to emphasize that oral information cannot be substituted by handing over the general informational materials prepared in advance. All this was brought about by the development of patients' rights, including the right to information (see the dogmatic differences in terms of the right to information between Act II of 1972 and Act CLIV of 1997).

The Supreme Court announced in a theoretical decision that

"The hospital owes compensational responsibility if the patient is not provided objective, thorough and realistic information.

The patient's statement of consent of examination, treatment and surgery given upon admittance to the hospital is not sufficient by itself to prove that the patient received appropriate information prior to the surgery." Act II of 1972 Section 45 Subsection /1/, Section 47 Subsection /3/ 15/1972 /August 5/ Ministry of Health, Section 83 Subsection /1/, Section 87 Subsection /2/ Supreme Court No. III. 22. 083/1998

Right to Self-determination[33]

The right to self-determination is based on constitutional rights, consequently its essential content is unrestrictable. The most important guarantee for the effectiveness of the right to self-determination is that as a major rule, it is a prerequisite that the performance of any health care procedure is subject to the patient's consent thereto granted on the basis of appropriate information, free from deceit, threats and pressure, which consent may be withdrawn from the patient's part.

A capable patient may exercise the right to self-determination via a legal representative in case of the existence of appropriate formalities /complete authorization with the power of proof etc.

[27] Act on Health Section 12

[28] Act on Health Sections 13 and 14

[29] Everyone is capable whose capability is not restricted or excluded by law Civil Code Section 11 /A person over the age of 18 is capable unless he is under guardianship restricting or excluding his capability/

[30] A minor is a person who has not yet turned 18 years of age except for his having got married. Civil Code Section 12 A minor is capable in a restricted way if he has already turned 14 years of age and he is not incapable. Civil Code Section 12/A

[31] Dr. Köles, T. (1999), Orvosi műhibaperek, HVG-ORAC, Lap- és Könyvkiadó Kft.

[32] Dósa, Á. (2004), Az orvos kártérítési felelősség , HVG-ORAC, Lap- és Könyvkiadó Kft.

[33] Act on Health Sections 15 to 19

The Act fully defines the cases upon the occurrence of which a patient's statement of consent about an intervention may not be required e.g. when the patient's life is in direct danger or the failure to carry out the given intervention or action would seriously endanger the health or physical safety of others.

From the point of view of patients' rights it is absolutely necessary to get to know Section 75 Subsection (3) of the Civil Code too, according to which the rights of an individual are not violated by the behaviour that the entitled person consented assuming that yielding the consent does not violate or endanger the interests of the society.

In the course of health care the physical well-being of a patient will, or may, be hurt in a given case, although it might be for the sake of healing, especially in case of an invasive intervention. The definition of the latter is indicted in Act on Health Section 3 Subsection M), according to which an invasive intervention is a physical intervention penetrating into the patient's body through the skin, mucous membrane or an orifice, excluding interventions which pose negligible risks to the patient from a professional point of view of intervention.

Act on Health Section 3 Subsection l) defines intervention, which logically bears a wider scope than invasive intervention. According to this intervention is any physical, chemical, biological or psychological act performed to for preventive, diagnostic, therapeutic, rehabilitation, or other purposes which will, or may, result in a change in the patient's body, furthermore, any procedure related to examinations performed on a corpse and the removal of tissues and organs.

Act on Health Section 15 Subsection (1) declares that the patient is entitled to the right of self-determination, which may only be restricted in the cases, and in the way defined by law.

The right to self-determination includes the issues listed below:

- the patient is free to decide whether they wish to use health care services;
- whether the patient consents to any interventions, and if they do, to which ones;
- which procedures they refuse;
- the right to participate in the questions concerning their examination and treatment.

It is a fundamental prerequisite for performing health care interventions and exercising the above rights that the patient yields their consent based on appropriate information, free from deceit, threats and pressure. After the model of international standards, it is called informed consent by the scientific literature that deals with Hungarian medical law. Section 3 Subsection (2) of the Charter of Fundamental Rights of the European Union, announced on 7 December 2000, also lays down that in the area of medical sciences and biology a person's free consent based on information must be respected according to the procedures set by law.

In the course of health care it often occurs that health care providers come into contact with patients who are either

incapable or have limited capacity to consent to treatment. Their statement of consent is required to be gained in one way or another as well. For this they have to be aware of some concepts. Without the knowledge of this, the informing doctor cannot find their way about who to inform about what and to what extent, who needs to be searched for in case of doubt about the patient's competence for action, may it be full or limited, or about their disposing capacity.

Legal Capacity, Competency, Minors, Incompetency, Limited Competency

For understanding the aforementioned notions, we must start with the concept of *legal capacity.* The Civil Code says that all persons in the territory of the Republic of Hungary have legal capacity, which simply means that they are entitled to have rights and obligations. Legal capacity is equal regardless of age, sex, race, ethnic background or religious affiliation. Legal capacity is due to each person, if born alive, from the day of conception.

This can be followed by clarifying the concept of *competency.* Everybody whose competency is not limited or disqualified by the law is legally competent. Whosoever is competent is entitled to conclude contracts and make other legal statements. Thus we have arrived at the statement of consent required for medical interventions, since it is a type of legal statement.

Persons who have not yet reached the age of eighteen years shall be deemed *minors,* unless they are married.

According to the Civil Code *incompetent* is

- a person who has not yet reached the age of eighteen years;
- a minor over the age of fourteen but whom a court has placed in a conservatorship precluding legal competency;
- a person of legal age whom a court has placed in a conservatorship precluding legal competency (such person may be placed in a conservatorship precluding legal competency whose necessary discretionary ability for conducting his affairs, owing to their mental state or unsound mind, is completely and perpetually absent);
- a person without having been placed in a conservatorship, but is in a state, that their discretionary ability for conducting their affairs is permanently, or at the time of giving their legal statement, completely but temporarily, absent.

Regarding health care services, an incompetent person's legal statement is null and void. In case of a patient who has been placed in a conservatorship by a court, their conservator or legal representative will proceed in their place.

Naturally it occurs that somebody is not completely incompetent, their state is called *limited competency.* A person with limited competency is:-

- a minor who has reached the age of fourteen years and is not incompetent;
- someone of legal age who has been placed in a conservatorship in such force (a court does this if the discretionary ability of a person of legal age to conduct their affairs, owing to their mental state, unsound mind or pathological addiction, generally, or in respect of certain matters, permanently or recurrently diminished to a great extent).

.Based on the aforementioned issues the court may restrict competency in exercising certain rights, as also in case of the rights related to healthcare services.

According to the Civil Code the legal statement of a person with limited competence is deemed valid only if it was yielded by their legal representative in case of a minor, or with the consent or subsequent approval of the conservator in case of a person of legal age placed under conservatorship limiting competence. In case of a legal disagreement the public guardianship authority will make a decision. If the limitation of competence ceases and the person becomes competent, they themselves will decide about the validity of their legal statements.

The Act on Health also disposes on limited competence as it follows:

A *patient with limited competence* is a person whom a court has placed in a conservatorship precluding legal competency generally according to the regulations of the Civil Code or concerning the rights practised in relation to health care services and a minor who has reached the age of 14 years and is not incompetent. Unless the law makes an exception, the rules included in the Civil Code are normative for the legal statements related to healthcare provision for such a person. It can be seen from this that the review of the above dispositions of the Civil Code was not superfluous.

Public Documents, Fully Conclusive Private Documents

The definitions for the words public document and fully conclusive private document are given in Act III of 1952 on the Civil Procedure Act Sections 195 and 196.

According to this, a public document is a paper-based or electronic document issued by a court, notary, other authority or administration within their scope of authority, in a predetermined format, as a public document it completely proves the included disposition or decision, and the realness of the data and facts testified by the document, as well as the making of the statement included in the document and also its time and mode. A document validated as to be a public document by another legal regulation bears the nature of being fully conclusive to the same extent.

In the case of the statements occurring within our topic the relevant *fully conclusive private documents* serve as complete proofs, until their opposite is proved, about its maker having made the statement. Included in the document and having accepted it, admitting it as mandatory concerning himself assuming that

- the maker has written the document with his own hands and signed it;
- two witnesses certify on the document with their signatures that the maker signed the document not written by them in front of them, or has acknowledged their signature as being their own; the place of residence (address) of the witnesses also has to be written;
- the maker's signature or paraph on the document is authenticated by a judge or notary;
- an attorney or a legal advisor proves by their legitimately countersigning the document made by them that the maker acknowledged the document, which was not written by them, with their own signature.

If the maker of the document is unable to read or does not understand the language of the document, a fully conclusive private document bears a full probative force only in case it shows from the document itself that the contents of the document have been explained to the maker by one of the witnesses or the authenticating person.

The Circle of Persons Entitled to Make a Statement

The Act on Health Section 16 Subsection (2) describes in a much detailed form that if a patient has no, or limited disposing capacity, and there is no person entitled to make a statement who will be considered entitled to do so in the order indicated below:

- the patient's legal representative, in the absence thereof,
- the individuals with full disposing capacity, and sharing household with the patient;
- in the absence of the latter, individuals with full disposing capacity not sharing in the household with the patient (the patient's child, in the absence thereof, the patient's parent, in the absence thereof the patient's sibling, in the absence thereof the patient's grandparent, in the absence thereof the patient's grandchild).

Consequently, a spouse not sharing the household with the patient or a person indicating themselves as being a common-law spouse are not entitled to make a statement. Whereas a common-law spouse sharing household with the patient is entitled to do so.

Decisions are the most difficult to make in the case of an incompetent or partially incompetent patient needs a health care service, upon the absence of which serious or permanent damage would occur and the relative wants to refuse the healthcare service. The relative may not refuse these services.

Neither the patient's or a previously cited relative's consent is required if the given intervention or health care to be provided seriously endangers others' health or physical safety, including a foetus having reached twenty-four weeks of age, or in case the patient's life is in direct danger. However, in the latter case the health care provider must take into account the patient's right to refuse healthcare services.

The Extension of an Invasive Intervention and the Right to Self-determination

In medical practice it occurs in countless cases that in the course of an invasive intervention an extension thereof becomes necessary which was not foreseeable. It may be surprising but the healthcare provider, the attending physician must take into consideration the patient's right to self-determination during such incidences as well, consequently the patient is entitled to the right of *informed consent* also upon the sphere of an extended intervention. Thus an extensive intervention may be carried out only if it is justified by an emergency or if failure to carry it out would impose a disproportionately serious burden on the patient.

If the extension of an intervention would lead to the loss of an organ or a part of the body or to the complete loss of the function thereof in the absence of consent to such extension, the intervention may only be extended if the patient's life is in direct danger or if failure to do so would impose a disproportionately serious burden on the patient.

Based on the experiences of the so-called medical malpractice lawsuits, legally defining the concept of an emergency was necessitated by all means which the new Act on Health took care of. According to this, *medical emergency* is a sudden change in health, which, in the absence of urgent medical care, would directly endanger the patient's life, or result in a severe or permanent health impairment.

However, legislators owe the elaboration of what *disproportionately serious burden* means for the patient. As a result of this, its definition always remains subjected to the given case and in case of a legal dispute other than obtaining the different means for evidence, it is a forensic medical expert's question. As far as we are concerned, we consider legal regulation necessary regarding this issue because in the absence of that, developing the views connected to this remains a task at judiciary level, which may be challenging where medically orientated questions are tested legally. Proposals from professional boards, maybe protocols will be necessary for achieving this target.

As far as our view is concerned, with the development of legal practice, solutions of a judicial nature will be found for this as well. In one such case the Supreme Court decided that it had to be taken into consideration that at the location of the given intervention what was practised regarding the methods, contents and length of information at the time. (Supreme Court 24 March No. 1998/226). Two years later the same judicial forum took the position of declaring that the obligation to information does not have to be judged in general but the measures of information is aligned with the given patient.

In total the patient gets into a position of making a decision of whether he agrees to an intervention in the knowledge of risks and complications after having been yielded appropriate information.

On the basis of understandable information a non-professional must also consider how the result achieved by an intervention is related to the risks of its absence. If a complication listed as a risk factor for a certain intervention, albeit a rare event, occurs, and the attending physician has not informed the patient about it in a certifiable way, the patient could not have been in a position to make a decision about its potential refusal and the courts will consecutively state the compensational responsibility of the healthcare provider.

The new Act on Health Section 19 Subsection (1) placed the patient's written consent being necessary into the legal authority

of the right to self-determination. According to this the patient's written consent is required to the utilization of any of their cells, cell components, tissues, organs and body parts removed while alive in connection with an intervention for any purpose not related to the patient's provision. The patient's consent is not required for the destruction of these materials in the usual manner.

Furthermore the patient has the right to provide for any intervention regarding his corpse in the event of their death within the framework of the Act. They may prohibit the removal of any organ and tissue from their corpse for the purposes of treatment, research or education.

The Right to Refuse Health Care[34]

The Act ensures the right to refuse healthcare for a patient with full disposing capacity. Where there is an absence of the provision of any aspect of care, that would likely result in serious or permanent impairment of their health, the patient may refuse the provision only in a document written with specified formalities, i.e. in a public document or in a fully conclusive private document, or in the case of inability to write, in a statement made in the joint presence of two witnesses. In the latter case the refusal must be recorded in the patient's medical record and certified with the signatures of the witnesses.

With the requirements of the aforementioned specified formalities, life-supporting or life-saving interventions may only be refused in the following cases:-

- the patient suffers from a serious illness which, according to the current state of medical science, will lead to death within a short period of time even with adequate health care, and is incurable.

Furthermore if

- a committee composed of three physicians, i.e. the patient's attending physician, one board-certified doctor specializing in the field corresponding to the nature of the illness who is not involved in the treatment of the patient and one board-certified psychiatrist, has examined the patient and made an unanimous written statement to the effect that the patient took his or her decision in full cognizance of its consequences,

Additionally,

- on the third day following such statement by the medical committee the patient declared repeatedly the intention of refusal in the presence of two witnesses.

A patient may not refuse a life-supporting or life-saving intervention if she is pregnant and is considered to be able to carry the pregnancy to term.

In case of a patient with no disposing capacity or with limited disposing capacity the provision of any care, the absence of which would be likely to result in serious or permanent impairment of his health.

If a patient with no disposing capacity or limited disposing capacity suffers, from a serious illness which, according to the current state of medical science, will lead to death within a short period of time even with adequate health care, and is incurable, and health care has been refused by him, the healthcare provider is required to institute proceedings for obtaining the required consent from the court.

In this instance, in case of a direct threat to life, the necessary medical care may be delivered until the court passes its final decision. The attending physician may use the cooperation of the police force, if necessary.

It is a commonly occurring practical problem when members of certain church communities have a pre-prepared statement generally refusing healthcare provision (blood transfusion). Independent of the given statement that the patient has brought with himself, the patient is required to be informed about the above listed issues in connection with his given disease and he is required to refuse the given provision in a document prepared on the spot, which statement may be taken into consideration as long as direct danger to life occurs. Except when the patient is incurable, in which case it can be taken into consideration further on.

The Act ensures that the patient may withdraw his or her statement regarding refusal at any time and without any restriction upon the form thereof.

We have to distinguish from the above cases when there is a patient with full disposing capacity dispose about the refusal of certain interventions in a public document, or names a person with full disposing capacity who will be entitled to exercise this right in his defence in the future. The statement has to be renewed every two years. The statement is valid if a board-certified psychiatrist has confirmed in a medical opinion, given not more than one month earlier, that the person had made the decision in full awareness of its consequences.

Even in the case of refusal of an intervention, a patient has the right to receive healthcare intended to ease his sufferings and reduce pain and must not be forced by any means to alter his decision and upon his further healthcare no disadvantageous discrimination of any type regarding him may be applied.

The Right to Become Acquainted with the Medical Record[35]

In relation to the right to information the Act especially specifies the right to become acquainted with the medical record, within the framework of which the patient

- has the right to become acquainted with the data contained in the medical record prepared on him or her;
- has the right to gain access to the medical record and to receive copies thereof at his own expense;
- has the right to request information on his medical data;
- has the right to be given a discharge summary upon discharge from the in-patient healthcare institution, furthermore to receive a written summary or abridged opinion of his health data for justified purposes, at his own expense.

[34] Act on Health Sections 20 to 23

[35] Act on Health Section 24

The birth of the Data Protection Act also helped patients a great deal in the enforceability of this right, but the Act on Health itself sets out that the healthcare provider disposes of the medical record, while the patient disposes of the data contained therein.

The healthcare provider also handles the data which is done partly according to the rules of the Act on Health and partly according to the regulations of the Data Protection Act.

The right to inspect the medical record of a person with no disposing capacity or limited disposing capacity is primarily ensured by law for the legal representative or in lack of thereof, for close relatives.

In the case of a patient's death, his legal representative, close relative, or heir have the right, upon written request, to become acquainted with health data that are, or may be, related to the cause of death, and data that are related to the medical treatment preceding death.

The Right to Professional Secrecy[36]

Among the rights related to health data, as a part of a patient's personality rights, the appropriate protection of health data and, in general, that of a personality are treated with high priority by the law. According to this, a patient has the right to have persons involved in his health care deal with their health care and personal data, which they might learn in the course of delivering such care, confidentially and to communicate them only to persons entitled for it by law, official decision by an authority, or the patient's statement.

The patient has the right to make a statement as to who can receive information on his illness and the expected outcome thereof and who should be excluded from becoming partially or fully acquainted with their health care data.

Health care data, the lack of which may lead to the deterioration of the patient's health may be disclosed to a person in charge of a patient's further nursing and continuing care, without the consent of the patient concerned.

A patient has the right to have only those persons present during the course of his examination and medical treatment whose involvement is necessary in delivering such care, or those persons to whose presence the patient has consented.

A patient has the right to have his examination and treatment take place under circumstances whereby it cannot be seen or heard by others without his consent, unless this is unavoidable due to an emergency or critical situation.

The patient has the right to name the person who may be notified of his admission to an in-patient healthcare institution and the development of their state of health and they also have the right to exclude any person too.

Obligations of the Patient[37]

Besides a patient being entitled to definite rights by law, they also have obligations. In the case of exercising their consensual rights, the patient has made a decision to use a healthcare service, therefore they are obliged to respect and observe the legal rules relating thereto and the institutional order. Within the boundaries of this Act:

- according to their abilities and knowledge the patient is obliged to cooperate with the health care workers involved in their care;
- the patient is obliged to inform them of all details necessary for a diagnosis, the preparation of an adequate treatment plan and for carrying out the required interventions, in particular, of their history of illnesses, medical treatment, medicinal drug use or use of paramedicines, and their health damaging risk factors;
- the patient is obliged to inform their healthcare provider of every detail in connection with their illness which may endanger the lives or physical safety of others, in particular of any communicable diseases, and of illnesses and conditions disqualifying them from pursuing an occupation. They are obliged to, for example. in the case of an infectious disease name the persons from whom they may have contracted the communicable disease and whom they may have infected;
- the patient is obliged to inform them of all former legal statements that they might have made in connection with health care;
- the patient is obliged to comply with the instructions received from them in connection with their medical treatment;
- the patient is obliged to observe the house rules of the healthcare institution;
- the patient is obliged to make the co-payment as provided for by law;
- the patient is obliged to show credible proof of their personal data as required by law.

In the course of exercising their rights, the patient and their relatives are obliged to respect the rights of other patients, furthermore, they may not violate the rights of healthcare workers stipulated by law.

Enforcement of Patients' Rights

Within the boundaries of the enforcement of patients' rights, the healthcare service provider must inform the patient or, considering the patient's statement of such nature, the person entitled to make a statement in connection with the patient's health status, of the rights of the patients, of the possibilities

[36] Act on Health Section 25

[37] Act on Health Sections 26 and 27

of enforcing such rights and of the house rules of the institution, upon admission or prior to the actual delivery of care.

The forums and proceedings serving the enforcement of the patient's rights are as follows:

- patient advocate;
- direct complaint towards the health service provider;
- direct complaint towards the maintaining entity of the health service provider
- out-of-court agreement offer to the health service provider
- Mediation Council
- county public health management administration department, National Public Health Medical Service;
- ethical proceeding within the authority of the ethical committees of the regional organizations of the Hungarian Medical Chamber
- the parliamentary commissioner of civil rights;
- civil litigation proceeding;
- prosecution.

A legally violated patient (or a patient who assumes to be legally violated) may initiate proceedings at the above listed forums.[38]

Investigation of the Complaints of Patients[39]

The patient is by law, entitled to complain, if they feel that their human rights have been violated during their healthcare provision.. The health service provider is obliged to investigate the complaint according to its internal rules and inform the patient of the findings of the investigation in writing as soon as possible but within 30 working days at the most.

The complaints must be registered and the documentation related to the complaint must be kept for 5 years.

Out-of-court Agreement Offer to the Health Service Provider

In cases where the patient does not receive appropriate healthcare[40] (or that is what he assumes) and as a result of this their health status worsens or the patient loses the chance for recovery (improvement of health status), they can claim financial or non-financial compensation. Their claim for damage can be enforced in two ways; in a civil lawsuit proceeding or with an out-of-court agreement. In the latter case in a letter addressed to the leader of the healthcare institution the patient may ask for a financial compensation (e.g. reimbursement for his lost income because of their compromised health status or for the extra expenses of their cost of living) or non-financial compensation (e.g. for the major impairment of their earlier life-style, for their physical and mental sufferings). This way of legal remedy is accessible if the health service provider admits having made a mistake which happens only in completely obvious cases[41]. A good agreement is advantageous for both parties, i.e. the patient gets compensation without a long and risky legal proceeding (losing a lawsuit can be expensive) and the health service provider minimises their legal expenses.

Complaint at the County Public Health Management Administration Department[42]

The organization of the National Public Health Medical Service has changed since January 1st 2011 and a significant part of the tasks of health management administration have been replaced by the public health management departments that function within the organizational frameworks of the county (or that of the capital) government offices. Consequently these authorities take care of the control and medical supervision of the functioning of the health service providers. An investigation under medical supervision may be carried out, among other instances, if a *complaint or conflict* that has occurred in connection with a specific case related to health care, and necessitates an investigation. Within the frameworks of supervisory activities numerous areas may be examined, like prevention, diagnostics, healing, nursing, care giving, rehabilitation, the professionalism, efficiency and quality of medical reports, the implementation of healthcare regulations, medical directives, protocols and the standards of methodological letters or the personnel and objective conditions necessary to perform the given duties. Based on a full and complete investigation, the manifestation of the necessary arrangements may be initiated, especially ensuring the appropriate health care in compliance with the medical professional rules, the suspension of carrying out the given healthcare activity, downgrading the progressivity level of the given healthcare provision, the withdrawal of the operating licence qualifying for healthcare service, as well as a healthcare fine may also be ordained[43]. The arrangements following the supervisory proceeding do not directly repair the legal grievance of the complainant, they sanction the health service provider and prohibit its continuation of illegal practices.

[38] Cf. Bánki, E. (2009), Betegjogi képviselők eljárásrendje. Betegjogi, Ellátottjogi és Gyermekjogi Közalapítvány, Budapest 2009. Except for the parliamentary commissioner for civil rights, see the chapter on insurance. Act on Health Section 29

[39] Act on Health Section 29

[40] Act on Health Section 7 Subsection (2) Health care is appropriate if delivered in compliance with the professional and ethical rules, and practice guidelines relating to the specific healthcare service.

[41] There is no way of knowing how commonly agreements are made in malpractice cases. According to the experiences of the writer of this chapter, it is not a rare case when the health service provider, which is obviously guilty, admits that financially it is better off if he comes to an agreement with the patient instead of a lawsuit proceeding.

[42] Act XXIX of 2004 on Certain Law Modifications Related to Joining the European Union, on Repealing Statutory Provisions and on the Statement of Certain Statutory Provisions Sections 141 to 143, Act XI of 1991 on Healthcare Authority and Management Activities Section 13/A Subsection aa) and ab), 15/2005 (2nd May). Decree of the Ministry of Health on the Professional Supervision of Health Service Providers Section 6 Subsection (1) b) and Subsection (2), Section 8

[43] In May 2011 a health fine may range from 30,000 HUFs to 5 million HUFs

Ethical Proceedings in front of the Ethical Committees of the Health Care Professional Chambers

The professional chambers functioning in the field of health are self-governing public associations of doctors and dentists, pharmacists and medical staff representing professional interests.

They are as follows:

- Hungarian Medical Chamber
- Hungarian Chamber of Pharmacists
- Hungarian Chamber of Health Workers

The chambers may create general professional behavioural-ethical rules (codices of ethics) according to their sphere of tasks, in relation to practising a healthcare profession, and they may carry out ethical proceedings with their members. The legal regulations concerning proceedings are identical for all three chambers. The code of ethics is created by the general assembly of delegates based on the proposal of the chamber's ethical board.

Under the law it qualifies as a violation of ethics if

- a guilty breach of standards of the code of ethics, created by the chamber, occurs
- there is a guilty breach of obligation, included in the statutes or other internal rules of the professional chamber, or a guilty breach of obligation arising from the chosen position (internal chambers of ethics cases).

Penalties imposed for ethical violations are as follows:

- warning
- reprimand
- a fine covering up to ten times the amount of the current minimum required monthly salary
- 1 to 6 months suspension in the membership
- exclusion in case of an extremely serious ethical violation
- a person must be excluded from the chamber if he was finally convicted to more than one year of imprisonment by way of executionor if he was definitively vetoed from pursuing the profession which his chamber membership was based on.

A professional health worker, pharmacist or physician receiving any of the latter three punishments is not allowed to practise his profession during the time of exclusion.

The Parliamentary Commissioner of Civil Rights[44]

The majority of the ombudsman type law protecting organizations do not possess power of legal authority, so they are not allowed to carry out decisive proceedings. It is the job of the parliamentary commissioner's of civil rights to investigate the anomalies related to constitutional rights or to have them investigated and to initiate appropriate arrangements referring to the given case in order to redress them[45].

Civil litigation Proceedings[46]

The primary (but not necessarily the first!) forum redressing the patients' legal grievances in relation to their health care is the court. According to Section 76 of the Civil Code "discrimination against private persons, violation of the freedom of conscience, any unlawful restrictions of personal freedom, injury to body or health, contempt for or insult to the honour, integrity, or human dignity of private persons shall be deemed as violations of inherent rights". Besides the aforementioned quotation, the Civil Code specifies more inherent rights relevant from the aspect of healthcare service. They are as follows:

- Protection against defamation. The statement, publication, or dissemination of an injurious untrue fact pertaining to another person, or a true fact with an untrue implication that pertains to another person is deemed as defamation. It is easy to admit that this injury can be committed both by the health worker and the patient either at the expense of one another or the institution.
- Any misuse of the likeness or recorded voice of another person is deemed as a violation of inherent rights. A person, for example, lying unconscious with his face being easily recognizable behind a chief medical officer giving an interview on television is subjected to such violation.

A person who has come into the possession of confidential and sensitive information and publishes it without authorization or abuses it in any other manner will be construed as having violated an inherent right.[47]

A person whose inherent rights have been violated may have the following options under civil law:

- demand compensation according to the rules of civil law responsibility (it has already been mentioned in the previous chapter);
- demand a court declaration of the occurrence of the infringement;
- demand to have the infringement discontinued and the perpetrator restrained from further infringement;
- demand that the perpetrator make restitution in a statement or by some other suitable means and, if necessary, that the perpetrator, at his own expense, make an appropriate public disclosure for restitution;
- demand the termination of the injurious situation and the restoration of the previous state by and at the expense of the perpetrator and, furthermore, to have the effects of the infringement nullified or deprived of their injurious nature.

The latter four legal provisions may fundamentally serve as moral restitution for the injured person.

[44] Act LIX of 1993 on the Parliamentary Commissioner of Civil Rights (The denomination of the commissioner is "commissioner of basic rights" from January 1st 2012 on).

[45] Constitution Section 32/B, Subsection (1)

[46] Civil Code Sections 75 to 83

[47] The health data is considered sensitive data, the violation of data protection rules may also result in criminal responsibility for violations.

Prosecution

Prosecution is not a proceeding of perpetration reparation. Punishment is the retaliation of behaviour, the implementation or non-compliance of which was prohibited or imposed in a given situation by the state. Some criminal factors related to patients' rights are mentioned here because their knowledge can help avoiding their realization.

The facts of "endangering within the sphere of occupation" can be "most easily" manifested by health care workers.

Section 171 of the Criminal Code:

(1) The person who exposes by negligence the life, corporal integrity or health of another person or persons by the violations of the rules of their occupation, or causes bodily harm, commits a misdemeanour, and shall be punishable with imprisonment of up to one year.

(2) The punishment will be

a) imprisonment of up to three years, if the crime causes durable handicap, serious health injury or mass catastrophe,

b) imprisonment between one to five years, if the crime causes death,

c) imprisonment from two years to eight years, if the crime causes the death of more than one person, or mass catastrophe.

(3) If the perpetrator brings about the immediate danger intentionally, he commits felony, and will be punished in case of Subsection (1) with imprisonment of up to three years, in case of Subsection (2), taking into account the distinction made there, with imprisonment of up to five years, from two years to eight years, or from five years to ten years.

From the aspect of patients' rights these types of behaviour are relevant because endangering, or especially injuring the patient's life, corporal integrity or health by negligence, is at the same time a breach of their human dignity. For "endangering" to be punishable, it is indispensable that it is realized by the violation of the rules of their occupation Nevertheless, it is a prerequisite that every health worker must or should follow the professional rules and standards of their occupational group.

In a legal sense a health worker (also) can be negligent in two ways. In a case evoking a more serious judgement the perpetrator anticipates that as a consequence of the occupational misdemeanour the patient/s will get in direct danger but they irresponsibly trusts its failure.

The other fact to be mentioned is the "failure to provide help":

Section 172 Subsection (1) The person who fails to provide help to an injured person, or to a person, whose life or bodily integrity is in imminent danger, commits a misdemeanour and will be punishable with imprisonment of up to two years.

Subsection (2) The punishment will be imprisonment of up to three years for a felony, if the injured person dies, and their life could have been saved by the help.

Subsection (3) The punishment will be imprisonment of up to three years, in case of Subsection (2) imprisonment of up to five years, for felony, if the dangerous situation is brought about by the perpetrator, or if they are also otherwise obligated to help.

This fact that anyone can realize by their non-action (minimum help is calling for help) but if it is committed by a doctor or a professional healthcare worker, the law threatens this deed with very serious punishment, since they are "obliged to help" anyway, in an emergency. Section 125 of the Act on Health: In emergencies, irrespective of time and place, the healthcare worker will provide first aid to any person in need, to the extent that said healthcare worker can provide such aid under given conditions with the implements available, and/or will immediately take necessary measures. In cases of doubt, the existence of an emergency will be presumed.

The Patient Advocacy System[48]

Patients may proceed personally in case their rights are violated or endangered but a special legal institution, namely the patient advocacy system, was created by the legislature, with regard to the specific nature of legal relations concerning health care to assist the law enforcement regarding patients' rights.

Considering its tasks and spheres of function, the patients' advocacy system of Hungary is a unique law protection organization in Europe. A representative's proceeding is typically of a general nature, i.e. it refers to every healthcare provision (not only the provisions financed publicly), it affects all levels of care (primary care, specialists' outpatient and inpatient care) and can be used before, during, and after the treatment. According to the regulations a patient's advocate has scheduled office hours, advertised in advance, on a weekly basis under the patient's legal representative of the inpatient facilities, and should be available by telephone during working hours. The healthcare service institution must give information on the person fulfilling the job of an advocate and their availability.

The patient's advocate has no official powers, they are not entitled to make decisions, they are responsible for information, mediation, the patient's representation at institutions and authorities and the prevention of legal violations.

Patient advocacy services include the following:

- the protection of patients' rights,
- informing the patients about their rights,
- assistance to patients in enforcing their rights,
- paying special attention to representing patients' rights of those at a disadvantage due to their age, physical or mental disability, health status or social situation.

The patient advocate may only proceed in individual cases within the boundaries of the authorization granted by the patient.

While carrying out their duty, the patient advocate is obliged to draw the attention of the head of the health service provider or maintaining entity to any unlawful practice and other shortcomings in connection with the operation of the health service provider and to make proposals regarding the termination of such practices and shortcomings.

[48] Act on Health Sections 30 to 33

The patient advocate's activities are:

Assistance with patients to get to know and enforce their rights. Within the frameworks of this task they give information and counselling upon the patient's request; they mediate between the health service provider and the patient in order to clarify potential misunderstandings.

The experience of the patient's advocacy system between 2004 and 2010 showed that patient's advocates are efficient "means" for handling patients' complaints.[49] In 2010, similarly to the previous years, among the recourse complaints to patient's advocates (14,617 cases), the legal grievance of the right to health care was leading with 41% of all cases, out of which 57% was about inadequate health care.Furthermore, 28% of these complaints were related to registration, 6% were in connection with death cases, 5% with the refusal of care and 4% of complaints referred to gratuities. The second most common legal grievance was the violation of the right to human dignity, its ratio having been 25%. Out of this, nearly 45% referred to unreasonable waiting, 43% to the tone of speech, almost 7% to the violation of privacy and 5% to discrimination (2% due to disability, 3% due to other reasons). The third leading legal grievance was inappropriate or omissions in information, with the rate of 17%. The ratio of the rest of the patients' rights grievances were: 6% related to the violation of the right to self-determination, 5% to the complaints connected to medical documents, 1-1%(statistical error, please check) to the right to leave the medical facility, to refuse health care, to medical concealment, and to redress complaints.[50]

Although "the patient's advocate possesses the appropriate expertise necessary to judge the professional questions, their role covers information, mediation, representation and proposals, i.e. by their position, it does not directly involve redressing legal grievances, they have *no decision-making power* [highlighted in the original source], authoritative or other powers. The existence of the legal institution in order to solve the asymmetric (especially the information-related) situation is indispensable whilst at the same time they only complement and not replace the entitled decision-making entity."[51]

[49] During this time patient's advocates proceeded in 76 354 cases of complain. Source: www.jogvedok.hu; The data on the year 2010 has not been published due to the cessation of the Public Foundation for Patients' Rights, Care Recipients' Rights and Children's Rights

[50] The data have been given by Ágnes Bodnár Kovács, the rapporteur of patients' rights of the (ceased) Public Foundation for Patients' Rights, Care Recipients' Rights and Children's Rights

[51] The report of the parliamentary commissioner of civil rights in the case No. AJB-995/2011 April 2011

For the patient's advocate to be able to fulfil their aforelisted tasks in a proper way,they must be independent of the health service provider which belongs to their scope of activities according to their legal position. Regarding Decree 1/2004 /January 5th/ of the Ministry of Social Affairs and Family Health a person with higher education, no criminal record and a minimum of 5 years professional experience qualifies for the position of a patient's advocate if they finished the courses required by the regulation of the cited decree and completed a successful test of, and against whom there is no ground for refusal. The Public Foundation for Patients' Rights, Care Recipients' Rights and Children's Rights invites tenders to fill the positions for patient's advocate's jobs.

Within the information given about patients' rights the health service provider is required to inform the patients about the patient's advocate and it must be ensured that the patients learn about the availability of the patient's advocate.

The health service provider is required to substantively deal with the patient advocate's complaints, substantively examine their suggestions and inform them about the result of the examination within a specified time.

The Mediation Council[52]

The mediation council is a unique legal institution which is put in place to resolve legal disputes that may arise between a patient and a health service provider in out-of-court proceedings. In the case of a legal dispute the parties may initiate the legal disputes that are appropriate for the mediation council to settle as opposed to the court.

Act CXVI of 2000 on Health Mediation Procedures includes the rules referring to the composition and proceeding order of the mediation council.

A mediation procedure may be requested by the patient, their close relatives or their heir in case of the patient's death and the health care provider. The application must be submitted to the regional forensic chamber nearest to the patient's place of residence or the place of the health care provider where the patient was treated.

A mediation procedure is an out-of-court proceeding which targets an agreement and works on a voluntary basis. It can only be initiated if both parties, the provider and the patient, have accepted a consultation procedure which they submit themselves to and they recognize the outcome as being compulsory concerning them.

The most important fundamental principle of a mediation proceeding is that all parties involved choose this option voluntarily; furthermore, they share commitment to trust and are obliged to maintain confidentiality. The mediation council does not make decisions and does not give legal advice. Within the framework of the mediation, a legal dispute proceeding may be resolved fast (the proceeding may last up to four months), which

[52] Act on Health Section 34, Act CXVI of 2000 on Healthcare Mediation Proceedings

serves in the interest of both parties. The patient quickly obtains the compensation, the health care provider and even the liability insurance holder gets into a more advantageous position since it would incur expensive court costs if a trial runs the course of several years. It is also an important to note that the mediation proceeding does not rule out the parties using the judicial route.[53]

A mediation proceeding also goes with expenses but they are much lower than the amount that would have to be advanced during litigation, or payouts in case of a loss of a lawsuit.[54] Due to its speed and relative economic costs, there were high hopes for mediation at the millennium.[55] Unfortunately, contrary to expectations, it did not become a "popular" institution in the validation of healthcare compensational claims. Among the reasons for this, is the role that, traditionally, Hungary has no history of mediation in conflict management

The parties designate the members of the council from the mediatory register listed by the Hungarian Chamber of Judicial Experts. The insurance holder which the health service provider has valid liability insurance with may also be involved in the proceeding.

The patient may be represented by a social organization which has the advocacy of patients' rights and human rights listed in its founding document.

During the proceeding the parties may employ a legal representative and the council may also employ an expert.

If the parties do not come to an agreement within four months following the first session, the council will terminate the proceeding.

The parties may agree a settlement, however, this settlement is only effective to the insurance provider if it was acknowledged or partly acknowledged by the insurance provider.

If the contents of the settlement are not executed by the party within the required time limit, the other party may request the court to supplement the settlement with an enforcement order.

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[53] Act CXVI of 2000 on the Justification of the Health Care Mediation Proceeding. General Justification.

[54] The costs in case of a claim higher than 300 000 HUFs in May 2011

- general cost of proceeding: 16 000 HUFs
- mediation costs: 5000 HUFs/hour but minimum 50 000 HUFs
- expert's fee: maximum 50 000 HUFs
- the parties' legal representatives' fee (payable to the other party) 3000 HUFs/hour
- expenses of the other participants of the proceeding.

The burden sharing in the mediation proceeding is expressly propatient. The parties are free to agree on the advancing of the costs but if they do not do this, the provider bears the advancing of the costs. If the provider withdraws from the mediation procedure, the provider bears the full cost of the procedure. If agreement is not reached, or the patient withdraws from the procedure, each party will bear its own costs of the mediation fees, expert fees, and the patient bears one-third of the expenses of other participants of the proceeding while the provider bears two-thirds of these costs. The general administrative costs will be evenly divided between the parties.

[55] Cf. Dósa, Á. (2001), Konfliktusrendezés közvetítői eljárással, Lege Artis Medicinae; 11 (5) pp 393-396

Rights and Obligations of Healthcare Workers

The law includes the multi-stage regulation of the provisional obligations of healthcare workers

In case of an emergency,[56] irrespective of time and space, the healthcare worker is obliged to provide first aid to any person in need, to the extent that the said healthcare worker can provide such aid under given conditions with the equipement available and/or shall immediately take necessary measures.

When mandated to provide in-area care,[57] the healthcare worker is obliged to take measures during his working hours, and in keeping with his professional competencies and expertise, to provide care for a patient requesting it.

A healthcare worker with the qualifications of a physician is obliged to examine all patients requesting to be seen. Depending on the findings of the examination,they shall treat the patient or, refer the patient to a physician or healthcare provider with the proper conditions.

A healthcare worker who does not have medical qualifications shall provide examinations for patients requesting them that are within his competency, or otherwise notify a physician with the authority to conduct said examinations. However, if made necessary by the patient's condition, until the arrival of the physician, they shall complete all interventions for which they are authorized on the basis of professional competence and experience.

Within the legal scope of the right to deny care,[58] compulsory or optional reasons are given by law, for example:

- a physician may refuse to examine a patient if prevented from doing so because of the immediate need to care for another patient, or because of a personal relationship with the patient. However, both cases are on condition that the physician refers the patient to another physician.
- reasons for refusing care depending on the physician's consideration are: if the treatment is in conflict with the physician's moral outlook, conscience or religious convictions, if the patient seriously violates their obligation to cooperate, especially if they regularly and intentionally do not comply with the instructions received, if the patient behaves in a manner that insults or threatens the physician, unless this behaviour can be attributed to the disorder.
- a physician is obliged to refuse the patient's examination and further care if their own health or some other obstacle renders them physically unfit to do so.

The law, however, involves a significant restriction concerning healthcare workers employed by a healthcare provider with obligations to provide in-area care.

In this case, the condition for exercising the right of refusal to care due to reasons of conscience, religious convictions or moral outlook is the notification of the employer in writing of this circumstance prior to commencing employment or immediately following the occurrence of the circumstance during the course of employment.

The law makes the obligation to provide information, to document and to maintain confidentiality mandatory for healthcare workers described in details within the scope of patients' rights.[59]

The Hungarian Act on Health obligates healthcare workers to ongoing training and education consistent with the current state of science and its advances, which is necessary for their professional development.[60]

The Protection of Healthcare Workers[61]

During the course of their work healthcare workers are exposed to high risks /emergencies in certain cases which justifies their special protection.

Within the scope of law, the means of criminal law are obviously the most suitable for this.

Under the law, a healthcare worker and other person employed by a healthcare provider, qualify as persons performing a public service of high priority by criminal law when performing any of the following:

- issuing a medicolegal expert report,
- judging fitness or unfitness to work, or the degree of which working ability has been impaired,
- conducting examinations as part of a procedure to grant a permit linked to work or career competency,
- conducting examinations as part of a procedure to grant a permit linked to physical fitness,
- conducting examinations as part of a procedure to determine eligibility for other healthcare, health insurance or social welfare services,
- performing mandatory public measures,
- performing an examination or intervention at the request on the orders of the authority,
- providing on-duty or emergency services.

[56] Act on Health Section 125

[57] Act on Health Section 126

[58] Act on Health Sections 131 to 133

[59] Act on Health Sections 134 and 135

[60] Act on Health Sections 140, 111, 112 and 115
Decree No. 18/2007/April 17th/ of the Ministry of Health on the Primary and Operational Registration of Persons with Healthcare Qualifications and the Authorization of the Operational Activities of Unregistered Persons, Decree 28/1999/April 17th/ of the Ministry of Social Welfare on the Rules of the Further Training of Professional Healthcare Workers

[61] Act on Health Section 139, Act IV of 1978 on the Criminal Code

A healthcare worker and other person employed by a healthcare provider have the right to continuously develop and advance their professional knowledge, in keeping with the current state of science and its advances.

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Legal Questions Occurring in the Course of Nurses' Practice

The Act on Health recognizes nurses' activity as part of healthcare services.

Concerning nursing activities, *Section 98 of the Act on Health* specifically lays down the following issues:

(1) Nursing qualifies as the total of the nursing and caregiving procedures targeted at improving the patient's health, at maintaining and restoring health, at stabilizing the patient's condition, at preventing illness, at alleviating suffering while maintaining the human dignity of the patient, and at preparing the patient's environment to participate in nursing tasks and including them in those tasks.

(2) Nursing
- a) is aimed at assisting the patient in conducting activities which they cannot do independently or only can do with significant difficulty because of their medical condition, or which would result in a deterioration of the patient's condition, or the conduction of which would require special training.
- b) is aimed at restoring the patient's ability to care for themselves, to reduce the pain caused by a disease and to alleviate suffering,
- c) serves to assess the responses to and needs caused by actual or possible health problems,
- d) serves to carry out the interventions called for in the therapeutic plan ordered by the attending physician,
- e) is tasked with providing health education and counselling services.

(3) Nursing is
- a) an integral part of healthcare services provided to the patient in an institutional setting,
- b) a supplementary part of therapy and rehabilitation provided to a patient in his home,
- c) a fundamental element of nursing and caregiving provided to a patient in an institutional setting or in his home.

(4) Nursing and caregiving based on a nursing care plan assist the patient in conducting the activities that contribute to his health, recovery, or rehabilitation.

In the cases set forth under Paragraphs a) and b) of subsection (3), considering the interactions of medical diagnosis and therapy, the nursing care plan is approved by the physician attending the patient. In the case set forth under Paragraph c) of subsection (3), the nurse prepares the nursing care plan on their own and implements it independently.

(5) Nursing and caregiving is to be documented in nursing documentation, which forms a part of the healthcare documentation.

The Peculiarities of Psychiatric Nursing

Special protection shall be put into place to safeguard the rights of psychiatric patients receiving healthcare services, specifically because of their situation.

The word "psychiatry" originates from the Greek word "psyche" which is the equivalent of "soul" in Hungarian.

Psychology is a science dealing with the examination of human and animal behaviour and related psychic phenomena and with the laws of the relationship between internal and external environmental conditions.

Psychic phenomena are psychological phenomena, the unity of psychic processes, which are characterized by generally unique laws that apply to these phenomena.[62]

According to the Act on Health in force, in case of psychiatric patients[63] there is a need for regulations that differ from the general regulations in two scopes of issues.

On the one hand patients who pose a significant direct threat to their own or others' life, physical well-being or health due to their psychic condition,[64] must be committed to involuntary medical treatment. This means deprivation of liberty, so a mandatory institutional[65] treatment ordered by a court and its subsequent review of legality are of fundamental significance.

The other issue, in case of psychiatric patients, is the enforcement of general patients' rights and legal guarantees of the restrictions of these rights and laying down the special rights that this patient group is entitled to.[66]

[62] See in details Tarr, Gy., pp 147 to 156

[63] A psychiatric patient is a patient whose attending physician has set up the diagnosis of mental and behavioural disorder /F00-F99/ or intentional self-abuse /X60-X84/ according to Revision X of the International Classification of Diseases. / Act on Health Section 188 Subsection d)

[64] dangerous behaviour: the patient, as a result of a disturbance in his psychotic condition, may pose a significant threat to his own or others' physical well-being or health, while the nature of the disorder does not warrant urgent institutional treatment. /Act on Health, Section 188 Subsection b) immediately dangerous behaviour: the patient, as a result of acute psychotic condition, poses an immediate and serious threat to his own or others' life, physical well-being or health. / Act on Health Section 188 Subsection c)

Special Rules on the Rights of Psychiatric Patients

This law lays down as a general principle, that the restriction of patients' rights is permitted only in cases where the patient's behaviour qualifies as dangerous, as long as this condition is maintained.

The law lays down two patients' rights of fundamental significance which are expressly connected to psychiatric care. They are as follows:
- a psychiatric patient is entitled to undergo psychiatric treatment within their family and home environment / community care
- This is closely related to the patient's right that during the course of their treatment the patient is to be treated with the least restrictive method, causing the least discomfort, as suited to their condition(s), while protecting the physical well-being of the other patients.

In cases where a patient displays dangerous behaviour, there is usually limited opportunities for giving detailed information to the patient and the elimination of the endangering condition must be started immediately as well, without the consent of the patient and despite his protest.

In cases where a confused, anxious psychiatric patient who exhibits immediate dangerous behaviour, in exceptional instances, the patient may temporarily need to be restricted in his personal freedom of movement (e.g. fixation, the application of a strong sedative). The law lays down the requirement of proportionality. Restraints may only be ordered by a physician.

[65] Psychiatric institute: any institution providing healthcare, or one also providing healthcare, that offers services to, supervision of, or care for psychiatric patients 24 hours a day, irrespective of other services provided by said institution, the body maintaining said institution, and the name by which it is known. A psychiatric institute providing specialized outpatient care for psychiatric patients, a home for psychiatric patients, and a rehabilitation institute, including a transitioning institution shall qualify as a psychiatric institute. /Act on Health Section 188 Subsection a)
Act III of 1993 on Social Administration and Social Provisions includes the differing rules regarding the home and rehabilitation institute of psychiatric patients.

[66] See also: Decree 60 of 2004 (July 6th) of the Ministry of Social and Family Affairs on the Institutional Admission of Psychiatric Patients and the Restrictive Measures Applicable upon their Care

In institutions where there is no permanent doctor on-duty service (e.g. in a home for psychiatric patients) a registered specialist nurse may also order a patient's restriction of personal freedom but the physician must be immediately notified of the restriction and that physician has to approve the measure within two hours. The patient's advocate or the patient's legal or authorised representative have to be notified of the application of restraint.

Institutional Treatment of Psychiatric Patients[67]

According to the law a psychiatric patient may be admitted to an institute for treatment in three cases:
- with the agreement of the patient /or at the request of the legal representative in case of a patient with no or limited disposing capacity/ voluntary treatment
- when displaying immediate dangerous behaviour with emergency /emergency treatment
- when a court issues a decision ordering mandatory institutional treatment /mandatory treatment

Voluntary Treatment[68]

In cases where psychiatric patients are in possession of full disposing capacity who do not display dangerous behaviour but their illness or condition necessitates institutional psychiatric treatment, according to the law, institutional treatment may be performed with the informed consent of the patient. A valid consent must be written prior to admission to the psychiatric ward.

A patient with no or limited disposing capacity may be admitted to a psychiatric institute at the request of their legal representative, or in the absence thereof, at the request of a relative, or in the absence thereof, on the basis of the notification of the guardianship authority.

By law a court investigates only the need for the institutional treatment and the validity of the consent in case of voluntary treatment of patients.

This court investigation is held ex officio in cases where patients with no or limited disposing capacity, while it is done at request in case of patients with full disposing capacity.

The person in charge of the institute is authorised to immediately transfer the request for a court investigation to a court.

Within 72 hours of receipt of notification the court examines whether the conditions of voluntary treatment are being met.

[67] Act on Health Sections 197 and 198

[68] See also Decree 36 of 2000 /October 27th/ of the Constitutional Court

Prior to rendering a decision, the court hears the patient, the person in charge of the institute, or a physician delegated by that person, and procures the expert opinion of an independent forensic psychiatrist, who is not participating in the treatment of the patient.

A patient is to be discharged from the institute at their request if they were admitted for voluntary treatment or at the request of the person requesting their admission, except in cases where the patient got into a condition of displaying immediate dangerous behaviour.

If a patient admitted voluntarily is not discharged at their request because in the course of treatment they manifest dangerous behaviour, the court subsequently decides if the measure is justified, and if the necessary conditions are met, it subsequently orders psychiatric treatment.

The court periodically reviews the need for mandatory institutional treatment also in case of voluntarily admitted patients.

In cases where a patient has full disposing capacity, a court review may be conducted only if the patient does not object, whereas in case of a patient with no or limited disposing capacity it is independent of the patient's agreement.

When the patient is in an inpatient within an institute for psychiatric treatment, the court reviews the case every thirty days, and when the patient is in a psychiatric rehabilitation institute, it reviews the case once every sixty days.

Emergency Treatment[69]

If a psychiatric patient manifests immediately dangerous behaviour and if the danger can be averted only by immediate admission to and treatment in a psychiatric institute, the physician observing this behaviour takes immediate measures to transport the patient to the proper psychiatric institute. If necessary, the police assist in transporting the patient.

Within 24 hours of the patient's admission, the person in charge of the psychiatric institute notifies the court and initiates a court finding that there were grounds for the admission, and requests a court order for mandatory treatment in a psychiatric institute.

The court issues a decision within 72 hours of notification. Until the court decision is rendered, the patient may be temporarily detained in the institute.

The court orders mandatory treatment for a patient admitted in an emergency if the patient exhibits dangerous behaviour and the need for institutional treatment exists.

Prior to taking its decision the court hears the patient, the person in charge of the institution or the physician delegated by that person, and procures the expert opinion of an independent forensic psychiatrist, who is not participating in the treatment of the patient. This proceeding is to be conducted even if the patient had consented to institutional treatment.

The court reviews the need for treatment every thirty days.

Mandatory Treatment[70]

The court orders mandatory treatment of a patient in a psychiatric institute when that patient exhibits dangerous behaviour but there is no cause for emergency treatment.

The procedure for ordering mandatory treatment is initiated by the specialist physician in the psychiatric institute who determines the need by notifying the court.

The court renders a decision on ordering mandatory institutional treatment within 15 days of receipt of notification by hearing the patient, the expert forensic psychiatrist, who is not participating in the treatment of the patient, and the specialist physician initiating the procedure.

If the patient does not appear when subpoenaed by the court, the court may order that they be brought by the court. Other coercive measures are not to be applied.

If the court orders mandatory institutional treatment for the patient, and the patient does not appear at the psychiatric institute within three days of receipt of the legally binding decision, the physician initiating the proceedings acts to have the patient brought in, for which they may request the participation of the police.

The court reviews the need for mandatory institutional treatment every sixty days.

Common Rules of Procedure[71]

According to the Act on Health the court procedure related to psychiatric patients is cost-exempt.[72]

The court local to the home or place of residence of the patient shall have jurisdiction in procedures ordering mandatory psychiatric treatment.

The court local to the headquarters of the psychiatric institute shall have jurisdiction in proceedings to review the need for treatment in a psychiatric institute.

Proper representation of the patient shall be ensured during court proceedings. When authorized by the patient or patient's legal representative, the patients' advocate shall have the right to represent the patient. If, in the course of the proceedings, the patient has no legal or authorized representative, the court shall assign a guardian ad litem.[73]

The patients' advocate or guardian ad litem representing the patient shall have to seek out the patient prior to the court hearing.

A decision taken in those proceedings may be appealed within 8 days of the announcement of that decision.

An appeal of a decision for mandatory institutional treatment shall not delay execution of the decision when the need for emergency treatment has been determined.

When in the opinion of the forensic psychiatric expert the patient is not competent to manage their affairs because of reduced insight or an absence of insight, the court shall forward the expert opinion to the public guardianship authority with jurisdiction to initiate proceedings to appoint a guardian.

[69] Act on Health Section 199

[70] Act on Health Section 200

[71] Act on Health Sections 201 to 201/A.

[72] The parties are entitled to cost-exemption in the court proceedings established in a separate law (see Act on Health) regardless of the parties' income and wealth relations. Decree 6 of 1986 /June 26th) of the Ministry of Justice and Enforcement on the Application of Cost-exemption in Court Proceedings

[73] A guardian ad litem shall be considered a person authorised to conduct a trial. In this case the state advances the costs of the guardian ad litem. Regulations on Civil Procedures Section 74

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Responsibilities and Compensational Obligations of Health Care Workers

Responsibility is the defensive mechanism of society against the situations and behaviours which oppose the standards ordained and required by the society. The violation of social norms, whether legal or moral norms, leads to adverse consequences. Ethical, disciplinary, civil, legal, misdemeanour and criminal responsibility may be imposed on the medical staff, furthermore they owe responsibility to their employer due to their work, according also to employment laws (being taken into consideration in a wide sense).

The Civil Indemnification Liability System

During the course of the healthcare workers' activities for damages caused by a third party, the rules of the Civil Code on Liability for Damage Independent of Contract shall apply. *Section 339 Subsection (1) of the Civil code states that "A person who causes damage to another person in violation of the law shall be liable for such damage. He shall be relieved of liability if he is able to prove that he has acted in a manner that can generally be expected in the given situation."*

The Civil Code defines the common rules of civil liability, to which all, general and special, responsibility forms must pertain.

- Illicit behaviour: all processes causing damage which are not specifically allowed by law are illicit. In certain cases causing damage is not illegal, such is a legitimate defensive position, or an emergency, or especially in health care, the consent of the aggrieved person.
- Damage: damage is any disadvantage which harms someone as a person or causes harm regarding a person's assets in the course of some harmful event. Accordingly we distinguish between pecuniary and non-pecuniary damage. Civil law liability is result liability, thus in the absence of damage we cannot speak of impeachment, i.e. the existence of the danger of damage in itself does not give grounds for compensation.
- Causal link: a direct or indirect causal link must exist between the damaging behaviour and the damage. In a causal relationship it is not only an active behaviour that may occur, but also the omission of activity.
- Fault: fault may be stated if someone has not acted as expected in the given situation. Consequently, expected behaviour is the desired behaviour which can be expected

from a person in a similar situation as the person who has caused the damage. In health care this can most commonly be proved with the help of medical documentation.

In civil law, the burden of proof is divided between the person who caused damage and the aggrieved person. The aggrieved person has to prove the existence of damage and a causal link. Whereas the person who caused the damage must either prove that there was a reason excluding the fact of violation or that though their behaviour was unlawful, there was no fault.

The purpose of civil law compensation damages is to ensure a complete repair, i.e. the aggrieved person must be brought to a position which they would be in, if the damage did not occur. Accordingly, the method for compensation is primarily the restitution of the original state. If it is not possible, or if the aggrieved person does not wish for it for good reasons, then the method for compensation is pecuniary and non-pecuniary reimbursement of the damage. The principle of "restitutio in integrum" may rarely be applied in case of damages occurring in the course of healthcare provision, so most commonly the caused damage is to be compensated in money.

In civil law it is not always the person who caused the damage who is liable for the recovery of the damage. The institution of underlying liability was deployed to increasingly protect the rights of citizens which is regulated in Section 348 of the Civil Code. "If an employee causes damage to a third person in connection with his employment, unless otherwise provided by law, the employer shall bear liability towards the injured person. The employer (healthcare institution, hospital) is liable for the damage against the aggrieved person instead of a person employed as a public servant if he causes damages to a third person."

The employer, of course, may assert a direct claim against the person who has caused the damage, but this may be done only according to the rules as laid down in the laws on labour. Due to the relatively high amount of compensations, healthcare institutions burden the insurer for damages in the amount charged (or part) to cover obligations by signing a liability insurance.

The System of Ethical Liability

Ethical responsibility refers to the behaviour demonstrated in the course of this activity.

An ethical misdemeanour means the violation of the professional rules of the medical and healthcare professions and culpable violation of the ethical rules of health care. These ethical rules are summarized in ethical codices, statutes by the professional chambers to provide help regarding decisions related to ethical questions for the workers employed in healthcare service.

An ethical proceeding must be initiated either at the request of the worker himself, or ex officio, or at the initiation of the authorities providing the supervision of healthcare services. An ethical proceeding is connected to a disciplinary procedure, since an organization belonging to the chamber may initiate the conduction of a disciplinary procedure at the employer.

The System of Disciplinary Liability

The disciplinary liability relationship is a secondary legal relationship associated with employment relationship, which is a liability system applied in case of a minor breach of duty originating from slight negligence, occurring within a work organization.[74]

The current Labour Code allows the application of legal consequences under culpable dereliction on one hand, and on the other hand, makes it partly contract-based since it provides an option to impose sanctions in collective contracts and disciplinary rules. The disciplinary penalty law is related to the employer's scope of rights, which may be exercised by an individual. The other subject to the disciplinary responsibility relation is the perpetrator of the disciplinary misdemeanour. The subject to the disciplinary liability relationship is the behaviour of employees disrupting the organizational order.[75] The purpose of the disciplinary punishment is to cause a disadvantage, but this is not applied for retaliation but in the interest of prevention. Thus punishment should only be applied if it is suitable for special or general prevention.

The forms of punishment range within a narrow selection and may be grouped according to their severity. The Labour Code does not contain an exhaustive list of these, so we review them on the basis of Act XXXIII of 1992 on the Legal Status of Civil Servants[76].

The sanctions of moral nature constitute the least severe group of disciplinary sanctions for disciplinary punishments; according to Section 45 Subsections (1) and (2) of the Act on the Legal Status of Civil Servants. The middle group includes sanctions with the content related to wealth and the status sanctions. The Act on the Legal Status of Civil Servants considers one sanction with the content of wealth allowable, and provides the option for an extended waiting time of up to one-year within a promotion system in Section 45 Subsection (2) b). The moderate disciplinary sanctions include the withdrawal of the mandate for leadership positions in our current labour laws. The deprivation of title is also based on status alteration, but it does not include property loss, however, some serious insubordinations are not compatible with the awarded person to remain the bearer of previously won accolades. Section 45 Subsection (2) e) of the Act on the Legal Status of Civil Servants e) regulates dismissal, the most severe group of sanctions, as a disciplinary punishment, which bears an additional penalty element, namely immediate effect.

[74] Polecsák, M. p 167

[75] Román, L. p 1

[76] All of this is especially justified by the fact that a significant part of healthcare workers belong under the enforcement of the Legal Satus Act

For the initiation of disciplinary action, the decision of the disciplinary authority is required, which includes the description of the suspected disciplinary misdemeanour. The initiation of disciplinary proceedings is possible only within specified time limit. The objective limitation period is calculated from the time of committing a disciplinary misdemeanour, which the Act on the Legal Status of Civil Servants determines in one year, while the subjective deadline is connected to the time of taking notice of misdemeanour, and a one-month time limit is laid down for this. Our effective law introduced the system of investigating judges in order to make disciplinary procedures more objective and effective. Investigating judges perform quasi-investigative tasks which are similar to those of the police and prosecution investigators. An employer's body, called disciplinary council, is competent to exercise penalty law. A disciplinary procedure will be completed with a decision which may be challenged by the condemned employee before the labour court. Since disciplinary and ethical responsibility in general are not separable, the employer must notify the competent chamber of the disciplinary procedure.[77]

The Legal Liability System of Work

The legal liability working relationship is an autonomous, separate relationship besides the working relationship.

Employee liability can be divided into two sectors, firstly, general fault liability, on the other hand, special liability irrespective of fault that exists for such damages which occurred upon the employee's take-over with return or accountability and that employee holds permanent custody of, limited use or handling.

The first element of the formation of labour law liability relationship is damage, in the absence of this, we cannot speak of a legal relationship. A further element of the facts of causing damage is the causational relationship and the unlawfulness of causing damage. The last element of causing damage is fault damage.

We speak about employees' compensational liability when a worker caused harm by culpable breach of duty originating from his employment. Unlike civil law, labour law makes a distinction between two forms of culpability on the basis of the damage having been done by an employee intentionally or out of negligence.

In case of harm caused out of negligence, the practice regarding compensation considers the actual damage to be compensated for, while the loss of profits is not taken into account. The employee's liability for damage only applies if the damage was caused by their fault, so they are not considered responsible if they were not guilty in causing harm, or if causing damages against the offender has not been proven. In case of employees' liability for damage, the employee's average earnings are calculated as the upper limit upon determining the degree of compensation. Consequently, in case of culpability, the employee is held responsible for the damage caused by them up to 50% of their average monthly salary, which may be maximized to six months' income in a collective contract, while 1.5 months of average earnings in an employment contract. In cases where damage is caused intentionally, the employee is obliged to pay for full damage.

The employee's safe-keeping liability exists if the employee takes over things related to their employment on the basis of invoice or receipt, or respectively, with return responsibility or accountability, and safeguards them permanently, uses or handles them exclusively, that employee is responsible for these things if shortage of them occurs, regardless of their fault, such things are for example mobile phones, laptops. The employee is exempt from liability if they prove that the shortage was caused by force majeure, or the employer did not ensure conditions for safe keeping.

[77] Román, L. p 1

The Misdemeanour Liability System

Misdemeanours are offences in unlawful behaviour which harm, or threaten the social norms of coexistence, prevent or interfere with the functioning of the administration, or are in conflict with regulations regarding the exercise of specific activities or occupations to a lesser degree than crimes. A misdemeanour may not be established if the act constitutes a crime.

In the course of healthcare activities misdemeanours may occur, which are illustrated by the following example. The operation of pharmacies is one of the activities of high priority in health care. A person commits a drug law enforcement misdemeanour under the provisions of Section 105 Subsection (1) e) of Government Decree 218 of 1999 (December 28th), which states that "the person who breaks the rules for the operation of pharmacies, shall be punishable with a fine of up to fifty thousand HUFs." Misdemeanour proceedings will be conducted as specified in a separate act.

Criminal Liability System

Among the liability relationships regarding health workers, the most serious one is criminal liability, which is regulated by the Criminal Code. Everyone can be expected to largely pay attention to others' lives, physical integrity or health, but there is no general criminal state of facts endangering life in the effective Hungarian criminal law, that is why a criminal offence can only mean endangering within the sphere of occupation.

Section 171 Subsection (1) of the Criminal Cade states that "The person who exposes by negligence the life, corporeal integrity or health of another person or persons by the violation of the rules of his occupation, or causes bodily harm, commits a misdemeanour, and shall be punishable with imprisonment of up to one year, labour in the public interest, or fine."

The subject of felony is a person's life, physical integrity and health, which are the subjects of a health worker's occupation or profession. A felony can be committed by the violation of the rules of the profession. Health professionals (nurses, physiotherapists, etc.) are personally responsible or accountable? for

their own actions, with the exception of students on hospital practice, for their activities supervisory physicians or other registered health care workers are responsible or accountable?.

A felony can be committed by directly endangering a patient's life, physical integrity, which means the occurrence of such a situation or condition, which carries the possibility for the occurrence of a legal grievance, and there is a cause and effect relationship between the behaviour of the offender and the specific emergency event. The above criminal facts evaluate felonies of negligence, while Section 171 Subsection (3) of the Criminal Code regulates intentional perpetration as a classified case. The Criminal Code regulates special health care-related criminal facts in a separate chapter, like for example, intervention of the human genome, altering the gender of an unborn child, violations of the right to medical self-determination.

Liability for Damage Caused to the Patient

According to Section 19/A of the Legal Status Act (Act LXXXIV of 2003), the patient or their relative may claim for compensation for damage, which was formed in the course of health care service or resulting in connection with that, directly from the public health service provider to enforce, regardless of the nature of the health care provider's legal relationship with the health worker who caused the damage.

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A Legfelsőbb Bíróság Munkaügyi Kollégiumának 29. és 31. számú állásfoglalása. (MK.) – Resolution Nos. 29 and 31 of the Labour Board of the Supreme Court

The Regulation of Labour Law Relationsips in Health Care

"Basic Concepts"

The scope of the Labour Code extends to the individual and collective labour law relationships, and shall apply to employees, employers and legal entities of collective labour law. Regarding the legal entities of labour law the Labour Code imposes an obligation for cooperation and includes the explicit prohibition of the abuse of rights concerned. The employer may provide information or opinion referring to the employee only in specific cases or with the consent of the employee. During the time of employment the employee may not jeopardize the employer's legitimate economic interests. The Labour Code includes provisions prohibiting both direct and indirect discrimination contexts.

Legal declarations regarding an employment relationship may be issued without particular formal requirements (orally or in writing), unless otherwise prescribed by any legal regulation pertaining to labour relations. A legal declaration made with the violation of formal requirements is invalid. The employment contract, its modification, the legal declarations on the intention of its cessation and, upon the employee's request, all other declarations should be put in writing.

Employment Contract

An employment relationship is established by an employment contract concluded in writing *(in case of public servants' employment relationship with appointment and its adoption)*. The employment contract consists of natural and incidental contextual elements. *In case of public servants' employment relationship the appointment document includes the differences listed below.*

As a mandatory contextual element the parties must agree on the employee's personal basic wage, job profile and the place of employment. The personal basic wage can be determined in hourly, daily wages or monthly salary, *(for civil servants, the appropriate payment is determined according to the official payment classification and grade that serves as the basis for a civil servant's salary)*. The employment relationship may be established for work performed at a permanent or varying place of work. The job profile is the summary of the framework of tasks performed by the employee, within which the specific tasks are determined by the employer.

The incidental contextual elements are those parts of the employment contract which may get to the contract based on the joint will of the parties. As an incidental element, a trial period may be set forth in writing in the employment contract, during which time either of the parties may terminate the employment relationship, without justification, with immediate effect. The duration of the trial period may be from 30 days to 90 days.

The Cessation of an Employment Relationship

The occurrences of the following legal facts lead to the cessation of an employment relationship, for which no separate legal declaration of the parties is required.

- The employee's death: originating from the nature of the employment relationship, it means the performance of tasks linked to a person, however, certain elements of it may be transferred to the heirs of the employee subsequent to their death (e.g. the employee's wages earned until their death).
- In case of the dissolution of the employer without a legal successor the employee is entitled to the benefits of an ordinary dismissal (they will be paid the sum equal to their average wages payable for the period of exemption from work, severance pay).
- The expiration of the fixed term.
- In case of disqualification from public affairs or occupation performance based on a judge's ruling.

Termination of the Employment Relationship

In cases where there is a termination of a legal relationship, the parties together or either party unilaterally makes a legal declaration to terminate the employment relationship, the common formal requirement of which is that it should be in writing.

Ordinary Dismissal (with Resignation or Acquittal)

Both the employee and the employer may terminate the employment relationship established for an unfixed-term by notice. An employee's ordinary dismissal *(resignation)* should be in writing, however it does not need to be justified, but the employee is required to do their job during the notice period. The termination notice is addressed to the entity that exercises the employer's sphere of authority.

The employer's ordinary dismissal *(acquittal)* should also be made in writing, but it must be justified. The justification must clearly indicate the cause therefore and the reason for termination must be unambiguously specified. In cases where employees who qualify as pensioners, the employer has no obligation to state reasons.

The notice period is proportional to the time spent in employment for the employer. The basis for the notice period is 30 days, which gradually extends to a maximum of 60 days in the case of 20 years of employment. In cases where the employer's dismissal is ordinary, the employee must be relieved from their duties for the duration of half the notice period, for which time the employee is entitled to their average earnings. *In a legal relationship concerning civil servants the dismissal time[78] is at least 60 days, but it cannot exceed eight months.*

Dismissal Prohibitions, Dismissal Restrictions

Dismissal prohibitions[79] are facts that exclude the employer's normal exercise of the right to dismissal. In practice this means that the employer's ordinary dismissal cannot lawfully be communicated during the periods specified below:

- incapacity to work due to illness
- sick leave for the purpose of caring for a sick child
- for the period of leave of absence without pay for nursing or caring for a close relative at home
- leave of absence without pay for nursing or caring for a child
- during pregnancy, for three months after giving birth, or during maternity leave.

The prohibition for dismissal does not apply to employees who qualify as pensioners and to the execution of collective redundancy.

Dismissal restriction[80] means that the employer may terminate the employee's employment relationship with ordinary dismissal only in particularly justified cases within the preceding five years of the normal retirement age.

An employee is entitled to *severance pay* if their employment relationship is terminated by ordinary dismissal or in consequence of the dissolution of the employer without legal succession. The amount of severance pay is proportional with the duration of the employment relationship for the employer. It is the sum of the average earnings of minimum one month for at least 3 years of employment and maximum six months for at least 25 years of employment, *(in cases where it is 20 years, it is for the sum of eight months' average earnings*), which increases by three months' *(four months)* earnings if the employee would reach the retirement pension entitlement within 6 years.

Extraordinary Dismissal

An employer or employee may terminate an employment relationship by extraordinary dismissal in the event that the

[78] See Section 33 of the Act on the Legal Status of Public Servants

[79] See Section 31 of the Act on the Legal Satus of Public Servants

[80] See Section 32 Subsection (1) of the Act on the Legal Status of Public Servants

other party wilfully or by gross negligence commits a grave violation of any substantive obligations arising from the employment relationship, or otherwise engages in conduct rendering further existence of the employment relationship impossible.

Termination of Fixed-term Employment

An employment relationship established for a fixed term is terminated by the expiration of the fixed term, the employee cannot terminate it with ordinary dismissal *(resignation)*. An employer may terminate the employment relationship established for a fixed term with a unilateral legal declaration, in such case however, the employee has to be paid one year's average salary, under the condition that if the period remaining from the fixed term is less than one year, the employee must be paid their average salary for that remaining period.

Regulations for the Performance of Work

Employees are obliged to appear at the place and time specified, in a condition fit for work and spend the working hours performing work, or be at the employer's disposal for the purpose of performing work during this time; and perform work with the expected level of professional expertise and diligence, in accordance with the employer's instructions and the regulations pertaining to the work. Furthermore, employees must cooperate with their co-workers and perform their work (also including preparatory and finishing work), in a manner without endangering the health and physical safety of others and without disturbing their work.

For economic reasons the employer may oblige its employee to work temporarily at places other than the normal place of work *(posting)*. On the basis of an agreement between the employers, an employee may be ordered to perform work also at another employer *(temporary assignment)*.

Working Time and Rest Periods

The working time of full-time employment is eight hours a day, or forty hours per week. The working time of full-time employment may be increased to not more than twelve hours daily or to sixty hours weekly for employees working in stand-by duty or for employees who are close relatives of the employer or the owner. Unless otherwise provided by a collective agreement, the work schedule must be for at least one week and it is to be communicated at least one week in advance.

Any work performed outside the work schedule, or over and above the working time cycle, or in stand-by duty qualify as special work duty. Regarding the particularities of healthcare activities, the employee may be required to be available for *duty*[81] at a specified location for specified length of time determined by the employer, or stand-by *duty*[82] spent at a place determined by them in the interest of ensuring continuous public service of social needs and the prevention or mitigation of an accident, or danger threatening life, health or physical integrity.

If the daily working time exceeds six hours, and after each additional three-hour period, the employee is entitled to a minimum twenty-minute, but not more than an hour-long continuous break from work while performing work is interrupted. Employees must be afforded at least eleven hours of resting time after the conclusion of daily work and before the beginning of the next day's work. Employees are entitled to two resting days each week, one of which must fall on a Sunday.

Employees are entitled to vacation time, comprised of basic and extra vacation, for each calendar year spent in an employment relationship. Vacation time is scheduled by the employer following advance discussion with the employee. Employers must schedule one-fourth of the basic vacation time as requested by the employees, in the year in which it is due.

Employees are entitled to a wage, at least a minimum wage, from the employer on the basis of employment; any agreement to the contrary is considered null and void. *In case of civil servants special promotions and salary system have been developed. Civil servants' jobs are tied to specific education and qualifications and based on these civil servants are classified into payment groups. The payment groups are divided into payment scales, which are determined on the basis of length of time spent as civil servants.*

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2003. évi LXXXIV. törvény az egészségügyi tevékenység végzésének egyes kérdéseiről – Act LXXXIV of 2003 on Certain Questions of Healthcare Service Performance

[81] See Section 4 d) and e) of Act LXXXIV of 2003

[82] See Section 12 Subsection (1) of Act LXXXIV of 2003

Special Labour Law Regulations in Health Care

Legal Sources of the Regulations of Labour Laws on Health Care

The health-related labour laws of Hungary as a EU member, can be divided into the following major legal sources:

EU Laws (decrees, directives, see Chapter 2)

Regulations of national law:

Laws:

- Labour Code (Act XXII of 1992)
- Act on the Legal Status of Public Servants (Act XXXIII of 1992, hereinafter referred to as Act on Legal Status)
- Act on Healthcare Service Performance (Act LXXXIV of 2003)

Decrees:

- The Enforcement of the Act on the Legal Status of Public Servants in Healthcare Institutions (Government Decree No. 356 of 2008)
- Collective Contract

In the hierarchy of legal sources the lower-level sources of law must not conflict with the higher-level sources of law, and respectively the special rules are to be applied as opposed to the general rules.

This means that the Act on Healthcare Service Performance, as a special rule, applies, as opposed to the Labour Code or the Act on Legal Status, as a general rule.

Special Regulations Related to the Establishment of Legal Relationships Concerning Healthcare Service Performance

Based on Section 7 Subsection (1) of the Act on Legal Status, besides the separate statutory qualifications and registration conditions, a healthcare worker is entitled to healthcare activities, not including activities performed on the basis of the provision requirements in case of an emergency, if he is suitable for carrying out the given healthcare activities on the basis of their state of health.

Subsection (2) determines within the frameworks of what kind of legal relationships the performance of the task may occur.

A healthcare worker is entitled to carry out healthcare activities, or to participate in them, among the available options, within the frameworks of the following legal relationships:

a) within the frameworks of freelance professional service,
b) as a healthcare entrepreneur,
c) as a member of a joint venture,
d) within the legal relationship of a civil servant,
e) in an employment relationship,
f) in a public service relationship,
g) in a service relationship,
h) as a person of the church,
i) as a volunteer,
j) as a member of a company.

(3) A healthcare worker referred to as in Section 4 b) may participate in carrying out healthcare activities according to the legal relationships listed in Subsection (2) c) to i).

(4) In the legal relationships referred to as in Section (2) a) and b) only those healthcare workers are entitled to practise healthcare activities who fully meet all the provisions relating to him included in Section (1).

The law states the requirement of the obligation to cooperate[83] for contributors in different legal relationships.

With the stipulation that among the available options, the above regulation of the Act on Healthcare Service Performance declares the free choice of a legal relationship by stating that within the frameworks of the above options only such a legal relationship may be established which meets the agreement of the parties (the healthcare provider and the healthcare worker).

The law contains the detailed rules referring to each legal relationship, out of which the rules pertaining to the employment relationship and to the public servants' legal relationship are discussed in detail in this textbook.

The employment relationship must be established on the basis of the regulations of Part Three Chapter II Sections 75 a) through Section 81 of the Labour Code, the civil servant's legal relationship is to be established on the basis of Part Three Chapter 1 Sections 20 to 24 of the Act on the Legal Status of Civil Servants.

Government Decree No. 356 of 2008 on the Enforcement of the Legal Status of Public Servants in Healthcare Institutions of Act XXXIII of 1992 includes regulations about the legal relationship of civil servants.

The decree includes special rules for tendering and definitions for jobs. Out of the regulations the ones listed below are highlighted as being the most important rules from a practical point of view.

According to Section 11 Subsection (1) six hours of the full working time must be spent at the workplace

a) by a civil servant who is exposed to damage of radiation for three hours daily,
b) by a physician providing a specialist physician's care at an outpatient surgery, a dentist of primary and specialist care, a school physician, a certified dental worker, and furthermore, the first- and second-level committee physician of committees reviewing the decline of working capacity,

[83] Section 18 Subsection (1) The healthcare workers participating in the care provided by the healthcare provider involved, regardless of their legal relationship to the performance of work, are obliged to cooperate during the course of the healthcare activity according to the regulations included in Subsection (2).
(2) The health care provider that provides healthcare service with the participation of healthcare workers doing their work within the frameworks of several types of legal relationships is required to take care of the individual workers' entitlements for giving instructions during the course of resolving their tasks.
3) The elaboration of the rules may be assisted by the professional chambers compiling recommendations.

c) by physicians employed at healthcare facilities for patients with skin and venereal, oncological, pulmonary, psychiatric and addictological diseases,
d) by health workers employed as infant's nurses at infant's conditioned care units,
e) by physiotherapists, medical masseurs if they exclusively perform tasks appropriate to their scope of work,
f) by civil servants conducting patients' and cared for persons' education and activities not according to a timetable.

(2) Out of the full working time, at least six hours must be spent at the workplace by a civil servant, who, according to the instructions of the employer, in his full working time
a) takes and examines bodily fluid and tissues;
b) works in an operating room;
c) works with cytostatic, biologically active, and with carcinogenic (ethylene oxide, formalin, asbestos) substances;
d) performs endoscopic examinations, or participates in carrying out the examinations;
e) performs or participates in autopsy;
f) works in the infusion laboratory of a pharmacy.

The difference between the above first and second paragraph is, that for employees employed in the jobs listed in the first paragraph, the full working time means maximum six hours of actual work daily.

Based on the second above paragraph, maximum six hours may be spent with performing the activities defined there but the health care worker may be assigned to carry out a different task for the remaining two hours.

The other important regulation pertains to the formerly known, work allowance.

Regarding Section 16 of the Decree

According to as defined in Subsections (2) and (3) civil servants are entitled to diagnostic, assistant's, traumatological, intensive care, infectological, psychiatric or nursing salary supplements (hereinafter referred to as supplements).

General Rules for Healthcare Activity Performance

Sections 5 and 6 of the Act on Legal Status provides the general rules, which must be complied by all healthcare workers, regardless of the legal relationship.

1. Healthcare workers provide healthcare activity with due care expected in the given situation, within the framework of the professional requirements, by keeping the ethical rules, according to their best knowledge and conscience, at the level determined by the available material and personnel conditions, in accordance with their professional competence. If it does not adversely affect the patient's status of health and he directs the patient to another physician, a healthcare worker may refuse healthcare activity, if the given activity is in conflict with their ethical views, or convictions of conscience or religion.
2. During the course of exercising their profession, a healthcare worker is guided by their commitment to the patients and by the highlighted protection of patients' interests. All healthcare activities occur in respect of the patient's personality, dignity and rights, while taking the patient's age and right to self-determination into account.
3. In cases where a healthcare worker carries out medical activity within the framework of an employment relationship established for a healthcare provider, in addition to the issues included in paragraph (1), the healthcare worker must take into account the professional superior/s' instructions, which are in accordance with the legal and professional rules.
4. The professional superior takes care of
   a) organizing the professional direction of healthcare workers according to Section 4 ab)
   b) the following issues concerning the healthcare workers under their surveillance
      ba) their detailed job description,
      bb) their participation in tasks, trainings and further trainings which ensure their development,
      bc) the regular supervision of their professional preparedness,
      bd) the evaluation of their achievement,
   c) their contact with the leadership of the healthcare provider.
5. Legal persons of the church may carry out healthcare workers' tasks as persons of the church.
6. Healthcare workers are obliged to regularly educate themselves by self-education and by taking the opportunities ensured by organized further trainings in order to be able to do their jobs in accordance with the current state of medical sciences, among the available frameworks of personnel and material conditions. The employer may reimburse a healthcare worker's incurred and documented expenses originating from further trainings of a mandatory nature (course fees, travel costs, accommodation costs etc.).

Suitability for healthcare activities

Sections 20 through 27 of the Act on Legal Status include the suitability conditions pertaining to healthcare activities.

Only that healthcare worker is entitled to carry out healthcare activities who is capable of and suitable for undertaking the given activities (hereinafter referred to as suitability for the job) concerning their health and mental and physical state (hereinafter collectively referred to as health).

The aptitude test conditions are also included in the Act (Sections 21 through 25).

Regulations Related to Working Time

The basis for the Hungarian regulations of the healthcare related working time is the Labour Code (in case of a work relationship), the Act on the Legal Status of Public Servants (in case of a public servant's legal relationship), and Government Decree No. 356 of 2008 issued on the Enforcement of the Legal Status of Public Servants.

It includes special rules, thus however, the primarily applicable law is Act LXXXIV of 2003 (Legal Status Act).

Definitions

Section 117 Subsection (1) of the Labour Code defines the concepts related to working time and rest periods. According to this:

a) *'working time'* means the duration from the commencement until the end of the period prescribed for working, that is to include any preliminary and concluding activities. Unless prescribed or agreed to the contrary, the duration of breaktime (Section 122 of the Labour Code) is not included in the working time, with the exception of stand-by duty;
b) *'daily working time'* means the duration of working time in a calendar day or in a twenty-four hour uninterrupted period;
c) *'weekly working time'* means the duration of working time in a calendar week or in a one hundred and sixty-eight hour uninterrupted period;
d) *' night work'* means work carried out between 10 p. m. and 6 a. m.;
e) *'shift work'* means any method of organizing work in shifts for the employer's daily time of operation exceeding the full working time of the employees, whereby workers succeed each other at the same work stations according to a certain pattern in a day;
f) *'afternoon shift'* means work carried out between 2 p. m. and 10 p. m. when working in alternating shifts;
g) *'night shift'* means night work carried out on the basis of work in alternating shifts;
h) *'night worker'* means any worker
   ha) who regularly works on a night shift as a normal course, or
   hb) who works during night time in at least one-fourth of his annual working time;
i) *'rest day'* means any period between midnight and 12 p. m. of a calendar day, or – unless otherwise prescribed by employment-related regulation or otherwise agreed by the parties concerned – a period of twenty-four consecutive hours preceding the next shift for workers working in three- or four-shift work schedule or at employers operating nonstop;
j) *'seasonal work'* means any work to be performed, due to the nature of the goods produced or the service provided, in a specific season or a given time or period of the year, irrespective of the conditions under which the work is organized.
k) *'stand-by duty'* means any work in which
   ka) due to the nature of the tasks belonging to the job, on the basis of a longer period, there is no work performed in at least one-third of the regular working time, and the employee may spend the time not used for working, with resting, or
   kb) work, especially considering the special nature of the job and the conditions for work performance, which involves much less of the employee's energy compared to the general level of such.

Section 4 of the Legal Status Act includes the following definitions:

a) a *healthcare worker* is every natural person, who performs healthcare activity,
   aa) who has the qualifications that entitle them to carry out the healthcare activities they are responsible for,
   ab) who does not have the qualifications referred to in aa) but is involved in the tasks performed by qualified healthcare workers,
b) an *employee working in health care* who is not subjected to the effect of a), but they are a person who has an employment relationship with the healthcare provider to ensure the functioning of the provider and the operation of health services
c) *on-duty service* is actual healthcare activity performed within the framework of on-duty care determined by Act CLIV of 1997 (hereinafter referred to as Act on Health), and also the availability at the place and time determined by the healthcare provider without carrying out actual healthcare activities,
d) *healthcare duty* is carrying out on-duty tasks defined in c) in an employment relationship or in the legal relationship of a public servant,
e) in addition to the issues included in *a) through d)* the definitions given in Section 3 of the Act on Health have to be considered.

The Legal Status Act includes the regulations concerning working time according to the reviewed working time directive. Deviations, however, can be found in relation to the rules of the Labour Code.

Working Time Cycle

Working time cycle means that the rules pertaining to working time and resting periods must be kept as for the average of a specified period (e.g. four months). However, there are absolute working time limits, the compliance of which cannot be examined as for the average of the working time cycle, but it will be discussed in detail in the next section.

Working Time Limits

Scheduling and complying working time have absolute and relative limits. Section 119 Subsection (3) of the Labour Code sets forth an absolute limit, according to which, pertaining to their schedule an employee's

a) daily working time may not exceed twelve hours, on stand-by duty it may not exceed twenty-four hours,
b) weekly working time may not exceed forty-eight hours, on stand-by duty it may not exceed seventy-two hours.

Any duration of special work duty must be included in the daily and weekly working time of the schedule.

Section 13 of the Legal status Act includes the special rules for working time in health care.

In addition to the normal 40-hour working time, up to 416 hours of healthcare duty may be ordered per calendar year for healthcare workers, with the stipulation that the total duration of special work performance and the imposed healthcare duty may not exceed 416 hours per calendar year. Except for extra voluntary work, the weekly working time may not exceed 48 hours as for the average of the working time frame according to the employer's provisions, with the stipulation that at the expense of this, the employer may order beyond the working time, according to the daily work schedule.

a) special work duty, or
b) healthcare duty.

Voluntary Extra Work

Based on a separate written agreement a healthcare employee may undertake extra work which may not exceed 12 hours per week in the average working time cycle, or if the extra work covers exclusively healthcare duty, then 24 hours per week.

The total duration of the normal working time and the mandatory and voluntary overtime, as for it's the average case of applying the working time frame, this may not exceed 60 hours per week, or 72 hours a week, if the healthcare worker also provides healthcare duty.

Daily Working Time Limits

According to their schedule, a healthcare employee's daily working time may not exceed

a) 12 hours,
b) in case of performing healthcare duty, 24 hours, including at least 12 hours of healthcare duty provision.

These seemingly complicated rules, which are worded in a rather complicated manner, are summarized briefly below:

- The normal working time is 40 hours per week.
- The mandatory overtime is 8 hours a week.
- The voluntary overtime is 12 hours a week (24 hours if solely on-duty service).
- Consequently the weekly working time may be up to 72 hours, including 48 hours of mandatory working time and 24 hours of voluntary overtime.
- Thus the annual working time limit can be defined by taking the weekly limit into consideration.
- The yearly limit of the mandatory overtime is 416 hours, the annual limit of voluntary overtime is 624 hours (in case of solely on-duty service 1248 hours).
- It follows then, that in the six-month average working time frame the mandatory overtime may be up to 208 hours, the voluntary overtime may be up to 312 (624) hours.

Resting Period

Between the completed healthcare activity and the following healthcare activity that started according to the work schedule, at least 11 consecutive hours of resting period must be ensured, which may be reduced to at least 8 consecutive hours of resting period on the basis of the parties' agreement in case of healthcare providers that provide continuous service twenty-four hours a day. In case of healthcare duty, this resting period shall be issued directly after completion of duty.

Notwithstanding Section 124 Subsection (8) of the Labour Code, in case of an employee referred to as for Section 127 Subsection (6) c) of the Labour Code, the weekly day of rest can be partly combined, if the employee performs on-duty tasks within their job responsibilities in at least 50% of their working time, with the stipulation that after six days of work, at least one day of rest is required to be issued.

The concept of resting period should be distinguished from the concept of a day of rest. The above provisions refer to the so-called compensatory resting periods following on-duty. From the point of view of scheduling working time, it is not all the same how the issue of days of rest is managed.

Ensuring two weekly days of rest, or time to rest equivalent to 48 hours as for the average of the working time cycle, is mandatory for employees employed in continuous, uninterrupted working order.

According to Section 124 Subsection (1) of the Labour Code employees are entitled to two resting days each week, one of which must fall on a Sunday.

By way of derogation from this, employees working in a working time cycle, may be provided a minimum weekly resting period of forty-eight consecutive hours that is to include a Sunday, in lieu of the resting days provided based on the work schedule.

By way of derogation from Subsection (1), employees working in a working time cycle, employed in continuous, uninterrupted working order, may be provided a minimum weekly resting period of forty-eight consecutive hours, that is to include a Sunday at least once a month, in lieu of the resting days provided based on the work schedule.

The Rules for Communicating the Working Time Schedule

Unless otherwise stipulated by a regulation of a collective agreement, the working time schedule, which also includes the healthcare duty and stand-by duty schedules, must be communicated to the healthcare employee in writing at least one month earlier in advance.

The Allocation of Vacation Time

The rules pertaining to determining regular vacation time are included in Sections 130 through 133 of the Labour Code. The rules regarding vacation time, applicable for public servants, can be found in Sections 56 through 59 of the Legal Status Act.

The regulations on the issue of vacation time are included in Sections 134 to 136 of the Labour Code.

Vacation time shall be scheduled by the employer following advance discussion with the employee.

Employers shall schedule one-fourth of the basic vacation time as requested by the employees, with the exception of the first three months of the employment relationship. Employees must indicate their requests for vacation at least fifteen days prior to the requested date of the first day of vacation time. Regarding the employee, if a circumstance arises due to which their work

obligations would meet disproportionate or significant injuries considering their personal or family circumstances, the employee must notify the employer about it with no delay. In this case, the employer is obliged to allocate the total of three working days of the quarter of the basic vacation, up to three times, at the time requested by the employee, with the negligence of the rule concerning the fifteen-day filing deadline. In case of the employer's demand, the employee is required to immediately verify the occurrence of the circumstances upon them starting work.

Vacation time shall be allocated in the year in which it is due. The vacation shall be considered to have been issued in the year in which it is due, in case it is commenced in the year in which it is due and if its consecutive duration will expire in the following year and the vacation time extending to the following year does not exceed five working days. Employers shall allocate vacation time

a) before 31 March of the year following the year in which it is due, or before 30 June of the year following the year in which it is due if so stipulated in the collective bargaining agreement, in the event of economic interests of particular importance, or in case of a cause directly and severely affecting its scope of operation
b) in the event of the employee's illness or another unavoidable restraint affecting the employee, within a period of thirty days following the cessation of such restraint subsequent to the year in which it was due. Even in such case, only one-fourth of the vacation time may be extended to the following year. No deviation from this regulation shall be considered valid.

An economic interest of particular importance refers to circumstances, being related to the allocation of vacation time and independent of work organization, upon the occurrence of which the full allocation of the regular yearly vacation time in the year in which it is due would quantifiably adversely affect the employer's economic management.

Vacation time may only be broken up into more than two periods at the employee's request.

Employees must be notified of the scheduled date of their vacation time no later than one month before the vacation.

Remuneration for Healthcare Duty and Stand-by Duty

The regulations referring to the remuneration of work is included in Chapter VII of Part Three of the Labour Code.

In respect of our topic, the remuneration of healthcare duty and stand-by duty are highlighted here.

According to Section 13/A Subsection (1) of the Legal Status Act an employee is entitled to a wage supplement or a contingency fee for healthcare duty and stand-by duty provision, the amount of which is determined by the collective bargaining agreement or the agreement between the parties, considering the rules on duty ordered in charge of the regular working time. In the absence of a collective bargaining agreement, or the parties' agreement, the wage supplement may not be less than

a) 70 % of the personal base wage or of the hourly amount of the salary for each working hour of the healthcare duty on weekdays,
b) 80 % of the personal base wage or of the hourly amount of the salary for each working hour of the healthcare duty on a weekly resting day,
c) 90 % of the personal base wage or of the hourly amount of the salary for each working hour of the healthcare duty on a bank holiday.

The contingency fee is a minimum of 25% of the personal base wage or of the hourly amount of the salary for each hour of stand-by. The rules for overtime[84] work must be applied for the remuneration of work performance ordered during stand-by duty, with the stipulation that the duration of work must be counted from the time of the employee's notification.

The amount of hourly remuneration for voluntary extra work performed by a healthcare employee is the amount, determined in Section 13/A and in a separate statute, increased by 50%.

Working Time Records

Keeping records of the working time is the employer's obligation, this documentation is the basis for payroll.

Based on Section 117 Subsection (1) a/ *'working time'* shall mean the duration from the commencement until the end of the period prescribed for working, that is to include any preliminary and concluding activities. Unless prescribed or agreed to the contrary, the duration of breaktime (Section 122) shall not be included in the working time, with the exception of stand-by duty.

Keeping an attendance sheet from the employee's part records the presence at work. The schedule, or the ordained overtime period determines which part of that presence will be working time.

Legal Reference

1992. évi XXII. törvény a Munka Törvénykönyvéről – Act XXII of 1992 on the Labour Code

[84] Section 147 Subsection (1) In addition to regular wages, employees shall be entitled to extra remuneration as defined in Subsections (2)–(4).
(2) Employees shall be entitled to a fifty per cent wage supplement for work performed in excess of the daily working time cycle or over and above the weekly or monthly working time. Employment-related provisions or an agreement between the parties may stipulate the provision of time off in lieu of a wage supplement; the time off shall not be less than the duration of the work performed.
(3) The rate of wage supplement for work on a resting day (resting period) shall be one hundred per cent; the rate of wage supplement shall be fifty per cent if another resting day (resting period) is provided.
(4) Unless otherwise agreed, the time off defined in Subsection (2) and the resting day (resting period) defined in Subsection (3) shall be allocated at the latest in the month following the month in which the special work was performed. When working time is specified in cycles, the time off, or the resting day (resting period) shall be allocated before the end of the given working time cycle.
(5) Notwithstanding Subsections (2)-(3), flat rate compensation may also be provided for special work duty in addition to the regular wages due.

4. Changes in the Concept of Health

BY PH.D. ZSUZSANNA FÜZESI, PH.D. KINGA LAMPEK

Introduction

There are few concepts which have been presented, analysed, systematized, argued, created and recreated by so many experts so many times. While most people reckon it is quite simple to word it for themselves, experts dealing with it consider it to be a very complicated, multidimensional issue.

What can be firmly stated is: the concept of health (and accordingly that of disease) follows the changes in various historical and social periods, cultures, power structures, development of medicine and health sciences, professional preferences, and the economic and marketing interests of services related to healing. In some respect a special reading of human history can also be discovered through getting acquainted with the changes in this concept. (Kéri, 2007) And the story has not yet ended …

Anyone who starts to study the concept of health cannot complain about the lack of special literature in this field because in addition to the abundant printed books and studies[1] there is widespread evidence available when searching online. The number of findings is 147 million in the case of 'health definition', 91.4 million for 'concept of health', and also in Hungarian there are 227,000 for 'the concept of health'[2]. There might be two disappointing features however; on one hand, there is often only the concepts of disease to be found, on the other hand, there were limited evidence available where we could locate all the different approaches concerning theconcepts of health. This follows not only from the varied character of the concepts but also from the fact that various authors approach the topic in accordance with their own profession, set of values, (possibly their interests), existing knowledge, cultural 'genes'[3], moreover they, also approach this topic according to their own informal health concepts.

We cannot promise we will do otherwise in this chapter. With the varied professional features of readers. With this view in mind,, the authors' professional approach, their values, moreover their individual view of health, intentionally or unintentionally, will be incorporated within the contents of the chapter. We cannot strive for completeness partly because of the physical limits, but we believe that we will be able to stimulate the interest of the reader to think more on this topic.

The concept of health – as everyone knows it

Possibly one of the best-known (and most argued) health definitions in the world was created by the World Health Organization (WHO) soon after the Second World War. According to this definition *'health is not only the lack of disease but it is the state of bodily, mental and social well-being' (WHO 1946).*

However, this concept which seemed idealistic then, as it does now, and is hard to be made operational in everyday life and medical practice. It had and still has an important message. Namely: in addition to formulating health positively, it embraces its totality and highlights its holistic character. Formulation and interpretation of health in this way in the 40s of the last century was connecting well to the socialization of European health care systems. It can be thoroughly presumed that both enriching the health concept and expanding health care making it available for wide layers of population can be conceived as a kind of answer to the most severe mass destructive war of the 20th century. (Szalai, 1986)

[1] Some important special literature – not a complete list –: Parsons 1951, Twaddle, Hessler 1977, Antonowsky 1979, Wolinsky 1980, Grossman 1972, Meleg 1991, 1998, Szántó, Susánszky 2002, Pikó 2006, Barabas 2006.

[2] At the time of writing the study, end of September 2010.

[3] 'Culture is the set of guiding principles which is inherited by the individual and which tells them how to see the world, how to experience it emotionally, and how to behave with other people, supernational powers or gods and the natural environment' (Helman 1998) . Part of this culture is also who is considered healthy and ill. Culture always has to be interpreted in its own context which context is influenced by historical, economic, political, social and geographical factors as well.

Since then the concept of health has also been dealt with – primarily in connection with health improvement - in numerous WHO documents. An important stage in this process is the supplement to the original definition which says 'health is of a degree at which individuals and communities are capable of fulfilling themselves and satisfying their needs, as well as coping with environmental challenges'. (WHO 1984) By highlighting the dynamic balance between the individual and the (social and natural) environment surrounding him and incorporating harmony, an ecological health concept was created. (Pikó 2006)

The concept of health – viewed by practising professionals

'Health equals lack of disease.'– representatives of the traditional *approach* beleive this is called a *biomedical approach.* According to this approach applied in healing practice, a disease – in simplified terms – is determined by symptoms and signs that are considered objective. Those who do not have them, more exactly where the measurable, examinable dimensions of these are missing, are considered healthy. Even if the signs, such as blood pressure, cholesterol level, blood-count, ECG can be considered objective, the symptoms about whose existence only the patient can tell the curing or nursing specialist cannot be listed in the objective category. In this latter case, what the individual communicates to the person who treats them from their complaints and symptoms related to the changes in their health is influenced by demographic factors as well as their social and economic state, individual personal qualities, subculture etc. and their health view that evolved through their socialization. In this respect, there are significant differences between men and women, the young and the elderly, educated and less educated, according to income and wealth positions of wealthy and poor layers of society, between those who belong to different nationalities or religions or other minorities, between nations and societies, the list of further examples is extensive.

According to the *naturalistic health concept,* health can be viewed in two ways as regards to everyday nursing practice (Reznek 1987, Kovács 1999). Firstly, health is statistically the most frequent state, it is the average. Any state different from this, consequently, is pathological and needs to be cured. The question is: should one get their high intelligence, exquisite beauty or splendid sight cured just because they differ from the statistically most frequent state? Secondly, naturalistic health concept views health as species-typical, natural. The organism is healthy when the organs can perform their functions according to the evolution plan. However, species-typical behaviour was ideal adaptation to a previous environment which has changed by now. Currently adaptation is achieved by not species-typical behaviour – as Kovács (1999) highlights it with the help of some expressive examples.

In the face of all these, healing and in some cases even nursing is dominated by the biomedical, pathogenetic approach of the health concept. The reason for this approach is that 'it is easily manageable'[4]. What is not measurable through medical knowledge and techniques available does not belong to the competence range of healing. 'Healers' are helped by this approach to 'feel safe' in their own special field, however, some of those who turn to them will definitely be dissatisfied with medical care, healing and nursing. Despite the rapid developments in medicine and its socialization (i.e. providing access to it), growing dissatisfaction with medicine and health care can be observed not only through research data but also in the fact that people turn against official healing, and increasingly use alternative healing (from self-healing to alternative medicines). (Szántó 2005, Buda, Lampek, Karácsony 1998)

Those who believe in the biomedical health concept think in terms of a dichotomy: *you are either healthy or ill.* From this it follows what their task is: in the first case there is nothing to do, while in the second case they have the well-defined role in taking part in restoring damaged health[5]. *Dissatisfaction with this dichotomy-type concept is revealed in the fact that those who believe in the dynamic health perception, think that health is a state which changes from time to time (often day by day) depending on whether signs related to a disease or a sense of health is dominant in the individual.* (Twadle 1977)

Concept of health – the functional approach

Presently the so-called functional model has been accepted in defining health – primarily approaching it in terms of public health. Sound bodily, mental, social functioning of the individual is determined in this model by the degree to which the individual can perform various activities. The highest level of functions is participating in the life of the society (community). (Vitai, Vokó 2006, Classification of Functioning, Disability and Health 2004) According to this approach, a person's health can be judged by the degree to which they can fulfil socially desired roles and tasks, that is to what extent they can take part in society's life, in its small and big communities, and how they can adapt to their environment harmoniously.

[4] It should be noted that pathogenetics – within the competence range defined by itself – is efficient and problem-oriented as to its interventions, that is, it is capable of treating and curing a significant part of these problems.

[5] Irrespectively of the previous criteria, health care is also often present in fields where other methods and solutions are acceptable, and would frequently be more efficient as well. These are either undertaken by the providers (for example through medicalization) or these providers accept that these belong to their range of activities (for example those dealing with alcohol and drug problems, and not long ago the issue of homosexuality as well). It seems if decision-makers and those in power consider a problem unwanted and do not want to treat it or criminalize it, then they medicalize it and vice versa.

The functional health approach, which is one of the most frequently quoted, was established by *Parsons* (1951). He determined health as the individual's optimal capability to perform social roles and tasks imposed by society or undertaken by himself efficiently. It is not only desired but also obligatory to co-operate, fulfil social roles and tasks (failing to do so may be sanctioned) in such a complex, organized and strongly integrated society like developed societies. Good health is essential for this, and the individual has to strive to restore it, to achieve the optimal state when a disease arises. Not only work-related roles belong to these social roles and tasks (think, for example, of children or those who cannot work because of old age) but also the varied roles that we have to fulfil at the same time from roles at home to roles arising from friendships.

The variety of roles to be met is influenced by the individual's life cycle, the importance of the given social role in the individual's life, therefore meeting them can be different as well. You focus on the parental role when you have young children, while you pay more attention to the role of a friend after your children have become independent – all the while-sustaining work-related and many other roles. Therefore the social relativity of the health concept is valid with this definition, that is meeting roles can be different because of their diverse character. (Pikó 2006)

Although the WHO definition is a starting point for W*olinsky's three-dimensional health-illness model,* he also defines another six hypothetical states in addition to the categories of health and illness. To establish these states he takes three dimensions into account: the medical (whether the individual is ill in medical terms), the psychic (if the individual considers themselves ill), and the social (whether the individual fulfils social roles and tasks). The simple qualification of 'healthy' or 'ill' received in these dimensions generates eight categories, where there is complete adequacy only in the case of 'normal health' and 'seriously ill' ('healthy' received the qualification 'healthy' in all three categories, and 'seriously ill' received the qualification 'ill' in all three categories). There are no clear correspondences in the other categories which are: pessimist, socially ill, hypochondriac, medically ill, martyr, and optimist. Wolinsky's demonstrates in a light hearted manner, how many ways we can fall 'ill', and how broad the contents of health and illness are.

The functional interpretation of health is not only significant in terms of scientific definition, but it also helps us to understand lay health philosophies, and the correspondence of health and lifestyle.

Health concept – from laymen's point of view

The health concept and attitude of non-specialists, that is laymen, may often be and often is different from official health definitions. In most cases it is much closer to the functional approach to health and the complex health concept of the WHO than it is to the biomedical view. Accordingly, laymen attribute a very important role to the mental, social and also the spiritual dimensions of illness in addition to the physical ones. Both concepts appear in their image of health and attitude to life, and in the content components of the definitions of health and happiness, and receive a distinguished place in addition to other components. This means there is a mutual connection between them, however the cause and effect relationship is not unidirectional, that is happiness is not caused by (not in itself at least) health, but their interaction can be registered. (Füzesi & et 2010)

Health and illness are not contradictory concepts in the everyday life of the lay population. *The opposite of illness is not health but non-illness, and the lack of pain does not automatically mean feeling well, it only means a pain free state.* (Könczei 1987) Not only research into lay health philosophies or health beliefs but also everyday experience suggests that there are many people who live with unwanted states and illnesses, and they still remain fit, moreover they consider themselves healthy apart from certain physical, somatical dimensions of health.

Laymen's – and also specialists' - attitude to health is influenced by a large number of factors, in which an important role is played by sociological dimensions (such as social status), individuals' beliefs about health (illness), their everyday environment and life, as well as their own and their family's health.

Szántó and Susánszky (2002) give a good summary of lay health philosophies based on their own and others' research. From their perspective, we will present some which are organized according to particular dimensions of health.

A healthy state

- is described as problem free bodily feeling according to the feeling-oriented health approach
- is characterized by the lack of illness symptoms according to the symptom-oriented health approach
- equals with the capability of carrying out usual activities according to the performance-oriented health approach
- means possessing suitable reserves with which for example illnesses can be fought back according to the resource-type definition
- means an ideal health state which is stated by the individual himself according to the norm-type definition
- means the behavioural way, actions carried out to achieve health according to health as behaviour approach.

In addition to these, there are single-viewpoint approaches as well, which only highlight one dimension of health in itself.

However, in the age of mass media, when the media have become an independent socializational factor, the prevailing health policy principles are also reflected (at least on the level of words) in the layman's health image. Yet these principles 'considered official' are not internalized by individuals, which can also be seen in the fact that activities to preserve and improve health often do not follow these basic principles. (Füzesi, Szőke, Tistyán 2008)

Theories affecting the health concept

Numerous theories and models had and have an effect on the health concept in addition to the social, economic, political, cultural factors mentioned in the introduction. Only a few of these are going to be presented in this study. In most cases, these theories have not had such a prompt effect on the changes in the definition of health as a new therapy or medicine when applied in medical practice[6].

Why are these regarded as important by those who work in healing, health care, and practice? The simple answer is, that they are an important part of their expertise. An even simpler answer is that this knowledge incorporated in these theories can greatly contribute to the protection of their own personal health if the acquired knowledge is considered to be a certain attitude and action based on it rather than a set of ideas to be acquired.

The theory of health capital

Contrary to public belief, health is not necessarily lost when one is getting older. It is a durable capital which loses part of its value through its use, but by investing in it, it can be maintained and might as well be improved. Grossman's theory modelled the cost of the health generation, however it was not ineffectual on the definition of health or the practice of health promotion. The individual – according to this model - undertakes an active role in both generating his own health capital and consuming his health capital (which he is born with) available for him. The former includes 'investments' (e.g. enhanced education), the latter includes 'wasting' (e.g. risky behaviours). The investments pay back, not only by better health state but also by access to other resources (e.g. work, income etc.) and also through enjoying their use (e.g. free time activities).

You need future perspectives to carry out these investments since the outcome of decisions concerning health is uncertain, mostly they are for the long term, while the decisions about them must be made much earlier (often decades before).

The health field theory (Lalonde Report)

The Lalonde Report (Lalonde 1974), published in 1975, first included the now well-known diagram, the health field and the related theory. According to this theory, in terms of health there are four areas having the greatest importance, namely: biology, lifestyle and environmental factors, as well as health provision systems. The health field was theoretically based on the *bio-psycho-social model* and resulted in a significant paradigm shift in the attitude to health and health improvement related to it[7]. Lifestyle has become the key concept of the new paradigm, where, in addition to doctors and health developers, psychologists, teachers, social workers have also received a significant role. (Kis-Tamás 2005)

The Ottawa Charter

The approach of the Lalonde Report (1974) and the amended health definition of the WHO (1984) are both summed up and bring about an important breakthrough in the Ottawa Charter (1986). Health is positively defined and in addition to anatomical integrity other dimensions are also included in this category such as ability to perform, personal values, family work and community role, the ability to cope with stress (originating from either physical, biological or social stress), the feeling of well-being, and being free from illness or early death. One of the most important messages in it that shows the direction towards solutions is the need to concentrate on exploring and using resources instead of concentrating on the lack of the same. In addition to all this, the social model of health was created in the Charter, which made it clear that health is socially determined.

The theory of salutogenesis

Researchers and health improvement specialists agree that *Antonovsky's* theory of salutogenesis (1979, 1987) had a very significant effect on the formulation of attitude to health and of the concept of health in the latter part of the 20th century. Antonovsky's model has helped in making the positive health concept more tangible, and based on the principles of this model new types of health improvement schemes could be built[8].

His theory was also motivated by the dissatisfaction with the health care service systems of the 70s and the prevailing health definition – the latter says that health is a stable homeostatic state. Contrary to this, Antonovsky considers health to be a process, which makes it possible to overcome off-balance states. Health – according to him – is dependant on how much the individual is capable of preserving his feeling of being healthy against different hardships, damaging factors, stressors. For this the individual can mobilize and use his available resources which help him to overcome his illness. The resources can be physical, mental, social, and recovery is basically influenced by the individual's sense of coherence. With this he gives the answer to the question of why some people stay healthy even if they are exposed to numerous damaging factors, or why they recover sooner than others.

One of the key concepts of salutogenesis is coherence. Components of the sense of coherence arise from experiencing the world as being comprehensible, problems as being manageable, and life as making sense. It is an attitude to yourself and the world, which in other words means that

- the world is not a chaotic, unstructured, unpredictable system,
- problems have solutions which are favourable for the individual, and the necessary individual and community resources to solve them are available,
- life is meaningful in terms of emotions as well, and for this reason it is worth avoiding harmful factors/behaviours. (Szántó 2005, Kis-Tamás 2005)

Feeling safe is an important element of the sense of coherence, which is characterized by the individual being in harmony with his environment, that they have the capacity to prepare for effects concerning their environment and themselves, and things can be expected to happen in accordance with their expectations.

In summary: the stronger the individual's sense of coherence, the control over their own life, the better their chances are of remaining healthy, that is the higher their relative health status in the health/illness continuum. Sense of coherence, the ability to control your own life are not only dependant on the individual's characteristics (ontogeny), but also on their social status[9]. Therefore the social determination of health does not lose its validity but the model also shows that there is a way out of this determination through the development of personal motivation and abilities, and through the building and mobilization of resources[10]. Therefore, in this model crises and hardships (stress[11]) are not to be avoided but to be treated, and the final outcome of all this will be a higher level of personal development. This state of mind is the opposite of *'learnt inability',* it is the state of *'learnt resourcefulness'.* (Kopp, Bugán 2009)

The experience of flow and the autoteleologic personality

The concept of coping in salutogenesis is closely related to *Csíkszentmihályi's* (1997) theory of autoteleologic self[12], which also had a great effect on health interpretation as well as on coping with illnesses, and – according to the authors of this chapter – holds exciting challenges for result-oriented health promotion.

Resulting in the flow experience, autoteleologic action is – according to Csíkszentmihályi – a challenge or opportunity for action which can be fulfilled with the available skills, it contains clear goals and in addition to that provides direct feedback about the process. *It is an important criterion that you do not carry out an autoteleological activity anticipating future advantages but simply because it is satisfying for you, that is you enjoy it.* As a 'result' you feel the 'perfect experience' (the flow) in which – in addition to the before mentioned – activity and consciousness merge, you feel a sense of great control, lose time awareness and defeatism, and all this stimulates you to exceed your limits and to develop.

It may not be necessary to draw the readers' attention to the fact that the outcome greatly contributes to preserving health – although unintentionally. As a result of this activity, not only self-respect or positive self-image are strenghtened but these positive feelings also induce a continuous development direction. In addition to these, resistance to stress is enhanced, the person's future vision is well-defined and subjective well-being is improved.

An autoteleologic person can experience flow, someone who, for example, possesses the features of general curiosity, is not self-oriented etc. In critical life periods, independent initiative, self-directed activity accommodate well-being. Among these even learning is included – as Csaba Pléh gives hope to teachers (as well as to health developers).

Health risks

At first sight, the consumerism of the past decades seems to have been favourable in terms of health. However, in these cultures, health, beauty, fitness are not only accompanying features of

[6] Unfortunately, even those who work in the field of health promotion know less than it is desired – due to lack of appropriate trainings. (Balogh, Barabas 2009)

[7] Unfortunately, in some countries health policy often uses the theory of health field to 'justify' why it is not worth investing too much in health care. In addition to the arguable character of this 'principle' in domestic conditions, an even more severe thing accompanying it is that the other side does not appear either: less attention or resource is given to the conditions influencing lifestyle.

[8] Though Antonovsky's model has deficiencies – as it follows from the character of models - , it does not query its significance. So for example it neglects – in contrast to the biomedical model at least – the individual's physical state, which is contradictory to the holistic approach also considered important by him.

[9] Research proving the socially determined character of health is extremely wide, only some of this is indicated in this study. (Makara1995, Tahin, Jeges, Lampek 2000a, 2000b Lampek 2004)

[10] Remarkable results have been achieved in connection with placebo research which forecast the following in relation to the future: on one hand everyone has remarkable competence, which can also be increased, to develop their events and states of mind, on the other hand practising this competence (e.g. supported by doctors in the process of healing) has objective consequences. All this could make it possible to acquire in practice a new range of responsibility, and would lead to an entirely new attitude to responsibility. (Szolcsányi 2010)

[11] Coping with stress is increasingly gaining ground not only in health development practice but also in everyday life, moreover some health insurers also recognize its significance. (Kricsfalvi 2006)

[12] The word 'teleologic' is derived from auto which means 'self' and telos which means 'purpose'.

good quality life or values that can be enjoyed in themselves. In addition to there being a fundamental will to thrive in life (the ability to perform social roles, seek, obtain and maintain employment, preserve 'marketability' through health); a moral requirement has emerged: illnesses, aging, even death can be avoided if we do our best, and a 'moral' person must act accordingly. (Szántó 2005)

The desired lifestyle and body models (like beauty, perfection) reach almost everyone through the mass media, and they become socially desired values to be followed and they are conditions of happiness. (Budai 2002) Therefore body and beauty cults become ends in themselves, and they are not basically motivated by health any longer. (Szántó, Susánszky 2002) Barsky (1998) calls this a process of *commercialization, where health is becoming a commercial commodity.* Health may become a particular commodity, which – like any other commodity – can be repaired or even bought (or bought back). (Füzesi, Lampek 2007) Health care, the use of medicines/curative products have become (due to being widely consumable) available, purchasable parts of mass culture. (Helman 1998, Pikó 2006)

Fear of losing your health (synonym for youth and beauty) leads to increased consumption of health in a certain way. Generating demand for health is supported by marketeers as well as health providers (and marketeers who supply these providers). Often they offer solutions to ward off fears about losing health and to have control of everyday health which are far less adequate than other solutions could be. Consequences may appear in increased dependence on health or any other service providers, defencelessness, reduced autonomy, uncertain self-definition, weakening coping mechanisms. All these taken together are reactive not only to the individual's health image but also to responsibility for his health and activities. (Füzesi, Tistyán 2004, Füzesi, Lampert 2007)

Healers', nurses' and other health care workers' health risks

When we speak about health risks we cannot leave out an occupational group, namely healers, workers and helpers in health care whose health is also endangered.

As it is widely known, they run physical, chemical, biological and psychological risks, which cannot be presented in this short chapter. From among those listed the psychological angle is provided in Károly Ozsváth's work (2007) – primarily in terms of preserving mental health – of which only one part is going to be highlighted here and now: 'One of the most important tools to preserve and maintain healers' health is their own self-knowledge. This is a quality that you are not born with but a self-image that you build through a set of successes and failures and through the conscious and unconscious internalization of appealing and off-putting models. It is a continuously corrected and still a relatively permanent inner map and compass, in psychology it is called identity, self-awareness. Self-knowledge and insight into human nature are closely related.'

Therefore health care workers are no exceptions to these general rules. All knowledge briefly outlined in this chapter can contribute not only to their specialized knowledge but also to their identity while it helps to preserve, moreover to develop – primarily their mental – health.

Limits of the health concept

How far can the health concept be expanded? Are there any practical boundaries which limit the concept and say 'this belongs here but another dimension does not'?

The former health definition of the WHO (WHO 1946) – according to not only our own but other authors' interpretation, already include for example spiritual happiness, social justice dimensions in addition to existential safety to mention only a few of those which fit into the complex development of the concept according to different individuals. (Barabas 2004, Bradby 2009)

Whereas generally agreeing with these dimensions, health care workers often refuse to consider them in respect to either formulating their professional values or performing their daily work. The arguments seem to be convincing: it is not their task to solve or manage all this etc. However, their effect – even despite their own reduced competences – is very important. Prominent roles are held in the changes in the health condition of a country's population by not only those who make decisions on the society level, politicians who basically determine people's living conditions, or religious leaders as well as social workers, but also those who practise a health care profession or provide health care services. For example, what principles and considerations apply when those who act in healing and nursing approach those population groups who lose their health and even life prematurely, who are at a social-economic-cultural disadvantage in order to cure them and preserve their health? Does this health concept include the basic principles of acceptance, fairness, social justice, human rights, equal chances etc. or not? Practising professionals cannot evade these questions in the health care system of a society which considers itself humane.

The health concept – as stated earlier in the introduction – undergoes continuous change and authors hope that a positive approach to health is increasingly gaining ground. *If the interpretation of a present health state as ' an inability to do something' is translated into 'the capability of doing something' and activities follow from this, people's everyday life, their life quality and feeling of happiness, are greatly influenced.* (Urbán 1995, Bagdy 2007) However, individual efforts are not sufficient to achieve this. Much research has indicated that only those individuals can lead a good-quality, healthy life to the full who are integrated into *a community***.** A man who has been deprived of his communities and connections and has no goals – even if he is ill – is an ideal actor of a consumerist society, but he can also be a hindering factor in the development of democratic societies. (Kopp, Skrabsky 2002, Kállai 2007, Füzesi, Szőke, Tistyán 2008)

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5. Organizational Sociology and Health Care

BY PH.D. KINGA LAMPEK AND PH.D. ZSUZSANNA FÜZESI

Introduction

The world of the 21st-century individual takes place in a social environment where relationships among people can present themselves in an infinite number of forms. It is only natural that from early childhood until the end of life we become members of numerous groups, the majority of which we primarily choose out of our free will and our participation in any given group's life may last a varied length of time. The alternatives for us to play different roles are also of a wide range and besides all of these, we can often decide on joining a group which is new to us. This phenomenon has not always been the case, since having been born to closed communities in societies prior to civilianization used to determine people's place in the family, in the division of labour, in local communities by designating and having expectations about the roles that were fixed by traditions. (Somlai, 1986) The family structure, however, such as relatives and local communities have been disintegrating since the latter part of the 19th century with people starting to belong to different formal and informal groups within the frameworks of organizations. This is still an ongoing process. (White, Klei 2008)

Each organization is established to fulfil some type of function/s within which people's cooperation and their roles in the organizations are regulated. In order to get to know the processes of nursing and provision for the sick, it is necessary to introduce the organizational system of conditions within the health care system. Several chapters of this book are about this topic which is approached from an organizational sociological aspect in this section.

In this chapter the major sociological characteristics of organizations and the attributes of health care organizations are reviewed and we analyze the system of relations that come into existence during the functioning of these organizations, the doctor-nurse-patient relationship and the factors influencing them.

The major sociological attributes of organizations

The lives of people, generally, are often connected to organizations. Life outside the family goes on within the frameworks of some kind of an organization in almost every case. We are born in a hospital or at a clinic, we learn the rules of life outside the family in day-care, kindergarten and then at school. Work is done within employment structures, we spend our earned income at multinational companies, brand-name shops or chain stores. In our free time we find friends and socialise in cultural institutions, at entertainment facilities and sports clubs whereas we have our ailments and illnesses treated in health care institutions. The examples indicated are not exhaustive regarding the presence of organizations in our lives.

The scientific approach and examination of organizations proves to be an exciting research area for sociology as much as for economics or management sciences. Organizational sociology engages in research, together with the sciences mentioned earlier, on existence within organizations, on its relationship to the environment and on the problems of organizations; but it differs from the other sciences in the respect that it puts social roles, the expectations connected to them and socio-cultural dependencies of causes and effects into focus. In this sense, this area investigates what kind of interaction there is between the typical groups of an organization, and its functioning in the work organizations; the problems that occur in the interactions of people who are in a close working relationship every day, and the reasons for the development of difficulties, as well as the interrelationship in the cooperation between the social environment and the organization.

The definition of organization and its types

The concept of an organization has been described by many ways. We introduce Chester Barnard's (1971) conceptual definition here, since besides its shortness and concision, it can be mentioned as one of the most commonly used definitions. According to Barnard an organization is a social collective system, the system of two or more people's intentionally aligned activities (Human collaboration in an organization is aimed at achieving joint goals and joint tasks. Each individual person belonging to an organization has his scope of duties, authority and responsibility. The peculiarity of the social functions sustained by organizations are that members of society either could not provide them separately at all or with a very low efficiency level. (Csepeli, 2003)

As we have already mentioned, there are a great variety of organizations in action, each one of which do their jobs in order to achieve specific goals while ensuring the gratification of different human needs. The aspects for the classification of

organizations can be manifold as well. They are demonstrated by examples below:

Based on goals:

- economic organizations e.g. drugstore chains, wellness hotels, production entrepreneurships
- protective organizations e.g. police, army
- social organizations e.g. parties, trade union, civil organizations
- public executive authorities e.g. local authorities, state, prisons
- public service organizations e.g. primary schools, universities, television, court
- health care and social institutions e.g. hospitals, outpatients' departments, youth custody centres, nursing homes

Based on ownership:

- publicly owned organizations e.g. schools, television, hospitals
- privately owned organizations e.g. economic entrepreneurships

Based on beneficiary terms: (Blau, Scott 1962)

- mutual beneficiary terms e.g. political parties, professional organizations
- economic beneficiary terms e.g. corporations
- beneficiary terms for public interest e.g. health care organizations
- public service beneficiary terms e.g. Hungarian Railway, fire fighters, post office

Based on partnerships: (Blau, Scott 1962)

- representing the interest of organizational membership e.g. trade union
- representing the interest of members of ownership e.g. economic organizations
- organizations representing the interest of clients e.g. consumer protection, health care, patients' legal representation, care for the homeless

As it can also be seen from the examples listed above, the classification of organizations are not unambiguous, since organizations generally realize several objectives and they simultaneously manage numerous functions. It is obvious that a hospital basically ensures health care for people but it also administers material resources because it is expected to be cost-effective in the delivery of care for patients. Regarding ownership, this can be owned by local authorities or even privately, it takes care of activities of public interest but it can involve the trade union of health care employees as much as organizations representing the patients' interests.

All of the previous groupings are important for organizational sociology but the aspects of being organized play an emphasized role. In this respect organizations can be formal or informal. (Schulte-Zurhausen, 2005)

Formal organizations are established to materialize well-worded, designable, susceptible targets and are basically built on the professional knowledge and impersonal relationships among people. They are characterized by consciously elaborate structures; their functions are regulated. The tasks and roles assigned to the members of the organization are well defined, the relationships among people are often characterized by hierarchical power relations but other than this, sympathy-antipathy based relationships (may) also develop. The existence of the latter though does not/cannot influence the functioning of the organization, the main element of operation is rationality. These type of organizations can mainly be found in the world of power organizations e.g. the police, county local authorities, prisons, investment counselling organizations, television, shopping centres, high schools, and hospitals.

Other groups of organizations are composed of those informal organizations that are also established to achieve intentional targets but the relationships among the members are primarily of emotional content, sympathy-based relationships that constitute the basis for the operation of the organization. Belonging to these organizations and the fulfilled roles in them are influenced by personal needs. In the informal organizations the relationship among the members is informal, the stability of the organization is ensured by the trust placed in interpersonal relationships. Examples of informal organizations are civil organizations, social circles and self-caring patients groups.

The formal-informal separation of organizations is often just an option. In reality, organizations have both formal and informal characteristics, their proper ratio can support the long-lasting good functioning of organizations.

A more detailed knowledge about the general features of organizations is provided by several books in Hungarian and in English, each of which approaches organizational functioning from different aspects, consequently their contents supplement one another well. (Csepeli, 2003; Dobák, 2006; Bakacsi, 2004) Out of the organizations this chapter is concerned with the organizational questions of the health care system in a more detailed manner.

The social embeddedness of health state

Maintaining people's health, the development and existence of diseases, the process of recovery and medical treatment are the result of such a multi-factored system where genetic, biological, psychological, social and ecological factors play a role together and independently of one another as well. The statement of

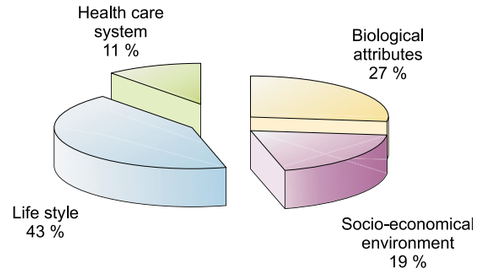

Chart 1: Factors determining the state of health (Source: Marc LaLonde: A New Perspective on the Health of Canadians, 19747)

Lalonde (1975), according to which remaining healthy and ensuring the conditions of health, develop on the basis of people's taking personal responsibility and also on the effects of micro and macro environmental factors, already sounds like a cliché today.

As can be demonstrated in the chart 1, the state of health is defined by numerous essential factors, one of which being health care. The social weight of the health care provision system is primarily on patients' care, its taking a role is substantially larger than it is attributed to the health care provision system in the determination of health state by experts. We can experience it in everyday life, too, that when we think of the restoration of health state, the process of healing, dealing with diseases, mainly the jobs of the health care provision system come to our mind, whereas we are inclined to exclusively mean the scenes of medical care by the concept of the health care system.

However, the health care system is embedded in society, it functions along with numerous further organizations, that operate actively or less actively. Its organizations, according to their functions, are part of the system interpreted in a wider sense, which assures a society to remain healthy and the healing and rehabilitation of patients. Let us have a brief look at this expanded system.

The chart 2 prominently illustrates that a significant part of the factors affecting health state remain outside the health care system as referred to in a narrow sense. People's health state is influenced by the circumstances of life provided by society, the level of economic development, the degree of existing inequities, the harmful effects of natural and social environment, the norms and culture of the given society.

Several sociological researchers (Ross, Wu, 1995; Knesebeck, Verde, Dragano, 2006) have proved that the state of health significantly depends on social status, it is determined by the so-called hard sociological variables like gender, age, educational qualifications, marital status, place of living, financial status, position at work, but psycho-social factors, like group support, being aware of personal control or a healthy life style also have a remarkable effect on it. (Ross, Wu 1995)

Naturally, other than these factors, the developmental stage of the health care system, its being equipped in terms of both

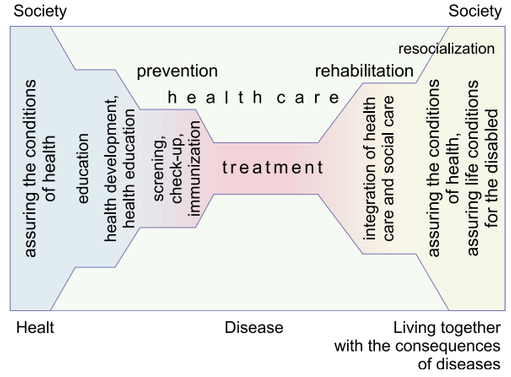

Chart 2: The scenes of health and their embeddedness in society (Source: The characteristics of the health care system by Kincses, Gy.)

professional human resources and infrastructural and material means are not negligible either. However, we emphasize that they do not have a primary role, even if their effect appears as the only direct reason for the worsening of health in people's lives and in the non-professional perception of diseases.

Health care organizations

If we intend to shortly summarize the goals and functions of health care organizations, it can be stated that their basic social purpose is to improve and maintain the health state of the population, to efficiently unite the differentiated medical and paramedical professions in favour of patients' care in a way that everyone can benefit from it with equal chances. According to the statement of WHO health care is efficient if it uses its resources in the highest accordance with its purposes. In order to achieve its goals, the functions of health care organizations spread over several comprehensive areas, like fulfilling mass diagnostic, curative, therapeutic, caretaking, research and educational tasks as well as accomplishing the economic, technical and administrative jobs done by health care management. (Gilson, Doherty, Loewenson és mtsai, 2007)

The bureaucratic system

Similarly to the organizations of a lot of other sectors, health care organizations can be mostly compared to the bureaucratic organizations described by Max Weber even if the Weber kind of ideal type was not primarily formulated regarding health care organizations and concerning several features of today's health care organizations, they differ from it. According to Weber, bureaucratic organizations provide a platform for rational activities and are characterized by stability, professionalism and predictability. (Weber, 1987)

In an ideal case the main attributes of bureaucratic organizations are listed below:

- within bureaucratic organizations there is an exactly defined division of labour that assigns the individual's jobs within the organization;
- rules serve as the basis for continuous organizational operations; there are definite regulations and spheres of actions and a defined office route is developed;
- in bureaucratic organizations there are hierarchical relations which are precisely fixed i.e. everybody knows who his subordinate or boss is and whose scope of authority is what;
- the members of a bureaucratic organization are characterized by professionalism, the cases are continually documented;
- the members of bureaucratic organizations are qualified, they are appointed to their positions, upon their appointment their education serves as grounds for competence, they do their jobs by occupation;
- loyalty to a bureaucratic organization is a crucial expectation;

Employees of a bureaucratic organization are characterized by objectivity, their jobs have to be performed unemotionally, they need to be objective during work.

The peculiarities of the health care system

The majority of the listed ideally typical characteristics can obviously be identified with health care organizations as well, whereas health care organizations possess numerous peculiarities that are exclusively typical of them from an organizational sociological aspect.

The value of health

In the health care system health is a 'product' that becomes the object of demand and supply, the value of which is not definable. A lot of people risk their health by smoking, inappropriate nutrition, a lifestyle that lacks exercise, the consumption of alcohol and drugs etc., the occurrence upon which health has no value. However, in case of losing it, health is upgraded, everything else gets a subordinate role in order to retrieve it. (Lippke, Nigg, Maddock, 2011) Consequently in an organization the realization of such a function needs to be ensured that first of all represents a symbolic value, its price and production costs cannot be calculated or else only with great difficulties.

Societal need and the degree of utilization

In the health care organization it is not only the production costs that can be made numerical with difficulties but the global societal need, the degree of factual utilization cannot be easily defined either. The need for health services and utilization are determined by numerous factors which are demonstrated in Chart 5.3.

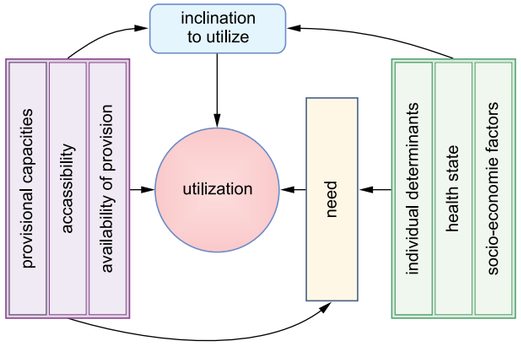

Chart 3: The model of the utilization of health care provision (Source: Vitrai, J., Bakacs, M., Kaposvári, Cs., Németh, R.: The inequities of the utilization of health care provision corrected to need in Hungary)

It can immediately be seen on the chart 3 that health care need definitely has to be distinguished from health care demand, since the former concept is considered objective based on the prevailing medical knowledge, while the latter is considered subjective based on the individual's information and earlier experiences. (Vitrai, Bakacs, Kaposvári, Németh, 2010) Other than these, accessibility and availability represent a further pair of categories. By availability it is meant whether the given service exists at all in the operation of the health care system, whereas accessibility means under what conditions and under what circumstances can patients get these services (how long it takes them to get the given service, how far they are from it etc.).

The above chart 3 well illustrates the most important, more or less plannable interrelations. Need and the inclination to utilize can be influenced on one hand by the patients' individual (age, education, attitude about health etc.) and socio-economic characteristics (labour market position, social status etc.) and by earlier experiences in health care on the other hand. Nevertheless, the evolvement of need is significantly affected also by the availability, accessibility and the circle of provisional capacities being at service. A great number of research projects have been done about the listed factors both in Hungary and abroad, which have unambiguously proved the relations having a cause and effect nature. (Kósa, 2009; Vitrai, Bakacs, Kaposvári, Németh, 2010) Consequently it can be stated that the mentioned factors are the ones with the help of which the emerging need and utilization can be forecast and estimated. At the same time unexpected situations cannot be prepared for. It is not foreseeable how many accidents will happen, what their consequences will be, what epidemics begin in a given year or how many people become chronically ill and with what kind of diseases. The surfacing health care needs generally cannot be postponed but if the health care provision is forced to do so, it is followed by excessive societal indignation (see waiting lists, put off surgeries, late arriving ambulances, the closing of hospitals etc.). Thus the functioning of the organization can be planned rather unpredictably, as a result of which several ad hoc situations have to be solved during the operation of health care organizations.

Austerity

As opposed to consumer societies being characterized by the abundance of products and services, the functioning of the health care system is characterized by steady-state financial hardship. Austerity by itself does not only mean financial or instrumental shortage but the lack of time and space dedicated to patients. Permanent service shortages in turn have several negative consequences, and this way is not just the missing service itself that causes problems. Service shortages result in the negligence of quality in every case, as if there are insufficient services or access requirement , then it is not the question of better or worse outcomes but the question of whether there is an availability or lack of availability that becomes a determining factor. This way the lack of financial resources influences the decision making processes of care providers: namely, in this situation diagnostic and treatment methods need to be applied which are barely adequate, even if there is a solution that could lead to success more surely and quickly but more expensively. (Kornai, 2008; Kis, 2010)

Austerity always creates unequal accessibility increasing the tensions caused by social inequalities. In the operation of health care organizations, the principle of reversed provision can be well observed, according to which the population in a better societal status obtains health care more easily and quickly despite its better health state and thus kicking over the concept of social justice. (Armstrong, 1995)

Austerity also causes operational issues in health care organizations because in today's modern societies, including Hungary, the equal chance for accessibility within health care is a moral question, a fundamental human right. Namely, it is unacceptable that e.g. the elderly, children, the poor, the homeless or anybody in society are unable to receive access to medical care because of a lack of funds. Hence politics cannot be excluded from the regulation of health care provision. We are speaking of a service which is always a political question in a welfare state, whether it is about its financing or the direction, degree and manner of state intervention.

A further consequence of healthcare shortage, is that the people who utilize health care provision become helpless; it can happen that they do not receive treatment according to their needs but they only get the ones available. Namely, shortages create dilemmas, in which the doctor-nurse-patient relationship gets distorted, dependency increases; in the patients' treatments the competition for advantages i.e. for health care services may get a larger and larger role. It is partly manifested by tipping the medical staff or other forms of gratuity.

Monopolistic position

The organizations of consumer societies can rarely achieve and sustain a monopolistic position. The market is full of rivals, their presence ensures all-time options for choices. In case of health care organizations though, we can hardly speak of competition since in many cases physical distances by themselves prevent patients from accessing a different health care provider. Besides, having a choice is not a common option either due to the fact that people struggling with health problems are mostly unable to assess their needs which are primarily determined by the service provider, usually the doctor. It may mean a further hardship that the patient cannot be assured that they have received a good quality service either, it is often difficult to assess whether the given medical intervention was necessary and successful. That is to say, in many cases medical interventions can be considered successful from the doctor's professional point of view, whereas the patient's quality of life might worsen considerably. (Kornai, 1998)

Therefore the functioning of health care organizations fundamentally differs from the operation of other bureaucratic economic organizations in many respects, however, knowing the reasons may aid the understanding and handling of the problems of an organization. (Gilson, Schneider, 2008)

System of relations in health care

Other than the concepts of organizations after Weber indicates that the organization typology is also based on Blau's and Scott's works (1962). In their publications they draw attention to having the designation of an organization to seeing what groups' interest are represented and worth considering as starting points upon the analysis of organizations. In this respect health care organizations are organizations that were established in the interest of clients/patients, since their activity and purpose is to cure patients, provide and administer treatment and deliver health care. Naturally, in reality, it is also a purpose for health care organizations to function economically, to create jobs etc. but there is not a single other function that can overshadow its basic task. Based on these relations, systems existing in health care have to be considered in a way that ensures that the patient / client is at the centre of healthcare.

Is it truly this way in Hungarian health care organizations? Does the system really serve primarily in the patient's interest? Who possesses the power, who is capable of transforming the processes and who are the suffering subjects of the functional errors of the system? We are searching for the answers to these and similar questions in the concluding part of this chapter. For this we will scan the personnel of health care organizations and the relationship systems among them, examining their major characteristics.

The client-centred organization

Scientific literature on organizational sociology is very familiar with the functioning of client-centred organizations and it verified in several researches that it was not a scarce experience that such organizations got significantly further from their designation or from representing the interests of their target groups. The reasons for this can be manifold:

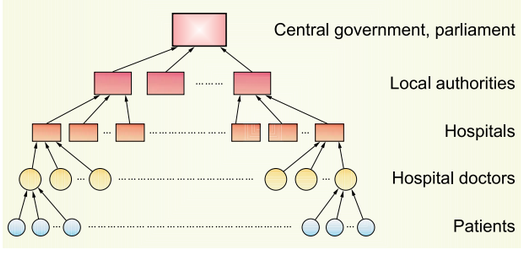

Chart 4: The hierarchical relation system of health care (Source: KORNAI, J.: The soft budget limit syndrome in the hospital sector)

- a small group takes over the leadership by their professional / political / economic power in a way that the members of the group do not belong to the clientage at all or just partially.
- the owner of the organization cannot or can hardly supervise the management leading the organization, consequently the designation can fundamentally get distorted according to the interests of the management. (Voszka, 2000)
- the informational asymmetry between the experts financing and providing services and the users of the service might be the reason for the organizational operation not being in accordance with its purpose or far from being optimal.

Since the above mentioned problems can refer to any client-centred organization, it is important to examine what kind of mechanisms ensure that health care operates in the interest of patients. This seemingly simple question theoretically can be easily answered from an organizational sociological point of view, since we need to have a look at the persons who participate in the functioning of health care organizations. They can be the owners of the organizations (government, local authorities), its financers (OEP i.e. Country-wise Health Insurance Pay-Office, private insurance companies), its employees (doctors, nurses) and the clientage (patients).

Let us have a look at the hierarchical relation system that exists among them.

Organizations controlling the operation of health care organizations

Groups controlling the operation of an organization are the ones that establish, maintain and supervise its regulatory system and effective functioning and employ its workers. According to the definition in scientific literature the approach of the factual control has to be started from the owner and/or the financer. (Amstrong 1995)

The owners of the health care system (hospitals, surgeries) are the local authorities that have provisional commitments, they are responsible for assuring health care services for the population. At the same time it raises a lot of questions about what kind of financial sources the local authorities have to use to cover the costs of this need. Does it solely have enough income to finance all the expenses (including development) that are not covered by health care insurance or by the patients' contributions? Answering these questions causes a lot of problems to the local authorities, so from their part, in a simplified manner, the only task to be solved is organizing the assurance of care in a way that the operation is preferably problem-free. In these processes representing the patients' interest is only important for political reasons, for political considerations, effective representation of interest does not take place.

The other organization that has a significant impact on health care organizations is the financer of their services, OEP - the Country-wise Health Insurance Pay-Office. Through financing, it controls the operation in order to make health care cost effective and economical. (Jávor, 2005)

However, coming up to this expectation often clashes with the interests of both care providers and the provided ones and so far it has not been able to create a properly functioning, plannable financing system.

We can rank numerous market participants, business enterprises among the organizations that practise environmental control in the functioning of health care organizations. They have taken a significant part and an emphasized role by their products and services in health care provision since the 90s. One of them is pharmaceutical companies that have an outstanding influence; they intervene with the health care processes a great deal, although 'just' indirectly, by, for example, having introduced and sustained doctors' visits.

Now in this process where is the doctor, the nurse or mainly the patient, in the interest of whom the organization operates? Nowadays unfortunately we must say that they are the ones who are capable of controlling the functioning of the organization only partially (doctors, maybe nurses) or hardly at all (patients). Chart 4 demonstrates well that in the many-participant system of health care patients stand, in their own client-centred organization, at the very bottom of the hierarchy and they are very far from decision making levels. They are far in a physical sense too but they are also far from service providers' level of knowledge. This situation could be resolved by a well-functioning system representating patients' rights, organized by patients but at present these are just opportunities ensured by legal regulations and in reality they do not mean an efficiently functioning representation of enforcing patients' interests.

Participants in the functioning of health care organizations

In favour of the recovery and care of patients the functioning of health care organizations is basically assured by doctors and paramedic professionals, like nurses, physical therapists, nutritionists, midwives and emts.

Out of the above mentioned groups now we are highlighting two groups, doctors and nurses, in this chapter, taking into consideration their ratio of presence within the health care system. At the same time we confirm the importance of the other paramedical professionals in health care but their role and presence are not analyzed here due to the remit of this book. However we recommend further readings on this topic within scientific literature which are listed at the end of this chapter.

Doctors' and nurses' roles together form an occupational role system that is labelled as a 'profession' in scientific literature. As a matter of fact, society labels only a very few occupational activities as true professions. The practitioners of this profession are qualified experts with a special knowledge, who serve the interests of the patients. The job of practitioners of a profession is connected to people, those who do this work are characterized by altruism not only during their work hours but outside of that as well; they immediately act according to the expectations of their profession if necessary. A profession related job is extremely useful not just by itself for the benefit of the client but also for his/her environment and the whole of society. Due to this, communities acknowledge this type of qualified work, it is held on high societal esteem. At the same time, their special knowledge creates a monopolistic situation for the representatives of this profession since they are the only ones who possess it.

The practitioners of this profession are not only in a monopolistic situation but they also have an especially significant degree of autonomy upon their work related activities since they can largely make themselves independent of the current political and economic environment. They themselves define their tasks, the social norms connected to doing their jobs, the circle of people performing their work and they are able to prevent outsiders from evaluating their work.

Due to a high degree of monopoly and autonomy, the professional organization brings forth the ethical code for the practitioners of the profession, which regulates their work. At the same time this professional-ethical code ensures supervision over the given professional area, it represents mutual interests, it maintains the monopoly of knowledge, it determines the criteria for members to be admitted, it provides protection against rivals and besides it supervises the professional knowledge and ethical attitude of the members. (Helman, 2003)

Strict inside regulatedness and a strong hierarchy characterizes the circle of the practitioners of the profession. The position taken within the hierarchy depends partly on professional knowledge and on power position. (Sági, 2006)

After the general conceptual review, let us survey how the question of this profession works out in today's health care organizations and how it contributes to the assurance of client-centred care. Starting from the fact that the tasks are done by practitioners of a high prestige and autonomous profession, it can logically be concluded that the purposes of the organization offer great opportunities. In our case it means that according to its designation, besides a high level of professional knowledge, the health care system does its curing, caring activity in a client-centred way, primarily in the interest of the patients.

Doctors

Although the contextual meaning of this profession has not changed, the system of conditions for the practitioners of this profession and along with this their relationship to the patients underwent several changes in the last two decades. (Balázs, Sztrilich, 2003; Firth-Cozen, 2003)

As it was previously introduced, the profession of doctors is an activity tied to autonomy and to the series of independent, free professional decisions and it considers itself sovereign of the rules of economy and accepting economic arguments. Nevertheless, the requirements for an economically efficient operation concerning health care organizations have been verbalized to a stronger or weaker degree since the democratic transformation. These requirements obviously restrict the freedom of doctors' medical pursuit, whereas they assure the economical sustenance of health care organizations.

Therefore doctors' scope for action has significantly narrowed down in this frame system. The essence of a doctors' profession, is that they wish to serve the recovery of patients. The more a doctor identifies with the interests of patients, the more probable it is that they dedicate more time to the treatment of the patient and spends money that burdens the budget of the hospital. It is especially so if the patient rewards the extra time, the costier diagnostics, treatments and the more recent medication in the form of providing a gratuity.

Other than the service of the patient, doctors can be motivated by professionalism, by professional ambition. If, as a result of this, they would like to keep up with the development of technology and science and that is why they are ready to resort to the freshest, promisingly more effective and at the same time more expensive medications, diagnostic methods and equipments, supplementary medical means etc. than the earlier ones, then they are very likely to oppose to the rules of cost-efficient functioning.

Doctors' 'sensitivity' about taking into consideration economic aspects can be achieved in two ways. Common sense may prevail by accepting the limitations of the resources at hand but it is more frequent that doctors take the administrative limitations, the strict control of costs, maybe the financial motivation against increased expenses as pressure. Day by day doctors are in the grip of motivations which contradict one another, like the urge to spend money in the interest of the patient on one hand and the financial and moral stimulation to restrict expenses on the other hand and this often distracts their attention from the client-centred patients' care.

We assume all of these result in the following issues that have been pointed out in a research done by Mária Kopp (Győrffy, Ádám, Kopp, 2005; Győrffy, Ádám, 2006) and her coworkers concerning doctors' society:

- the degree of chronic stress at work has increased to an extraordinary extent;
- besides the expectations for growing efforts and taking jobs excessively, the ratio of bonuses has decreased considerably – it primarily boiled down to the psychological feeling of satisfaction –, the feeling of being in control, trust and the option for practising medicine with devotion have also diminished;
- being burnt-out, leaving the profession and the country have been characteristic of doctors' society.

Nurses

We have been able to speak about the nurse's profession since the work of Florence Nightingale (1820–1910) who was the creator of nurses' worldly work as a profession in a modern sense. In the society of her time Florence Nightingale recognized the ever growing demand for a large number of qualified nurses. Nightingale established a nurse training school in London where students were educated both theoretically and practically and qualified nurses could take jobs as hospital nurses or private patient's nurses. In nurse training institutions an almost military discipline was required from the trainees. Nurses had to dedicate their way of life fully to the interest of patients' recovery and for this they had to execute the doctors' instructions precisely. (Abel-Smith, 1964) The relationship between doctors and nurses were based on authoritarian principles and was characterized by the constant presence of soldierly order and discipline. Although the prestige of nurses' work built on professional knowledge was recognized even at that time, it has kept its traditional prestige hierarchy in its relationship to doctors even today. This is supported by a survey on prestige which was done in 1988, according to which out of 156 jobs society ranks nurses' work as the 11th most useful one. In spite of this, from the point of view of income this profession was listed in 100th place. Researchers found the biggest difference between usefulness and the degree of income in case of this occupation. The necessary knowledge for doing this job was placed as 38th according to the people questioned. (Blasszauer, Jakab, 1994)

Despite the above mentioned issues we can keep on considering nurses' work as a profession based on several criteria and the following reasons:

- The high degree of societal necessity which is increasing due to the peculiar demographic trends.
- The altruistic inclination and the service done for communities connected to nurses' activities.
- The requirement for more and more specialized professional knowledge which is supported by scientific results.
- Nurses' early choice of career and their dedication to work. (Feith, Kovácsné, Hajagos, Balázs, 2007)

Nurses' work in health care organizations, similarly to that of doctors', is done in the interest of the patients; their tasks can be connected to the most diversified areas of nursing among numerous work conditions resulting in stressful situations. Working in two or more shifts, considerable responsibility and adaptive skills, the lack of autonomy, physical and psychological strain etc. can be such examples. (Artazcoz, Artieda, Borrell, Cortes, Benach, Garcia, 2004; Knudsen, Ducharme, Roman, 2007)

Since nurses spend their work hours almost completely among patients, the client-centred provision of service is more obvious. This is amplified by the fact that other than the verbal form, patient-nurse contact also involves touching the body and ordinary and extraordinary situations may take turns in their work. The relationship between the patient and the nurse is direct, nurses often have much more information about patients than the doctors who treat them. The nurse's position between the doctor and the patient bears the nature of a mediator. However, this middle position is subordinate and authoritarian at the same time, the offences caused by doctors, the head nurse, subordination, the pressure due to the nature of their job and conflicts can often 'poison' the relationship with patients. (László, Susánszky, 2006; McGrath, Reid, Boore, 2003)

Patients

Healing jobs bear a special significance in every society. The effectiveness of the process typically goes with considerable uncertainty since it is questionable in every case whether the given person recovers or not. The doctor, the nurse achieve or can achieve cooperation via their relationship with the patient, but considering the contents and the nature of the relationship between the parties we can speak of manifold options. We cannot undertake the detailed introduction of these here but knowledge about them can be obtained and widened from the reference studies. (Buda, 1989/a; Buda, 1989/b; Crutchfield, Morgan, 2010; László, 2006; Parsons, 1951; Williams, 1997)

According to the client-centred concept of health care organizations every activity is performed in the interest of the patient. The patient obviously expects the people who work in the organization to cure them as soon as possible and as fully as possible and in the meantime to suffer as little as possible and endure as little inconveniences and subordination as possible. Other than this, most patients require the doctor to listen to their complaints patiently and to provide them with the necessary information about their disease and the diagnostic and treatment alternatives. The patients' demand is similar in relation to the nurses as well i.e. patients' will claim to want more attention, patience and an appropriate amount of time for being nursed. However, the patient would welcome the improvement of not only the personnel but the financial conditions of curing just as the more comfortable hospital care. These are completely understandable, rational expectations. The majority of these wishes though are accompanied by extra costs, the coverage of which is not at the health care organizations' command. So what is left from the patients' wishes? What kind of grievances can the patients who get health care services have?

Based on the research done among the users of health care organizations the above problems can be summarized as listed below:

- in health care organizations patients consider the access time to services unjustifiably long and the period of time for being dealt with and cared for too short.
- asymmetric information flow in the doctor-nurse-patient relationship is typical i.e. patients are not informed about the indispensably necessary issues for making their decisions, consequently they participate in the organizational processes passively and helplessly.
- patients are not aware of the possible circle and quality of available services, or the process of curing and the course and risks of the treatments and interventions.
- patients have to struggle with the difficulty that they can find out about the essential characteristics of the received services only subsequently or after having utilized them for longer. The case is more serious when the consumer is either not capable of judging the quality of the service even after the service or they can judge only its fragments.
- patients do not understand the language of curing neither from the verbal communication or from the documentation in relation to their status.
- the received medical interventions are almost exclusively determined by the therapeutic doctor, the patient is very rarely given a role in the decision making process.
- practically there is no one to turn to with the complaints that have risen during patients' care. The conflicts having developed this way cannot be undertaken by the majority of patients because they do not have a proper amount of information with appropriate contents and there is no adequate forum for discussing these problems either. (Tahin, Jeges, Lampek, 2000)

According to the research results the interests of patients can be seriously offended and we do not wish to blame the doctors or nurses about this. But it is important to admit that the realization of services of client-centred health care organizations is considerably questionable.

Summary

In this chapter we have given a brief summary about the functioning of societal organizations, health care organizations among them, and the problems occurring during their operation. We have also reviewed the relations system of health care organizations. From all of this we can draw the conclusion that the influence of doctors, nurses and patients upon health care organizations varies a great deal. A relatively narrow circle of doctors, namely the ones who are are in power positions, can have a significant effect on shaping the organizational processes, though the circle of people who hardly have any effect, or just partial effects on the organizational operation processes is much wider. Interestingly enough they are the doctors who invest the most energy in satisfying patients' needs and thus provide a client-centred service. Almost the full range of nurses resemble them, they are mostly capable of realizing a client-centred care via their developed direct contact with the patients. However, all of these do not affect the factual transformation of the organization to become client-centred because these two groups possess the least information in relation to strategic developments and they stand the furthest from power positions. The worthwhile transformation of health care services though, is not possible without them.

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6. Literature Research in Nursing

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The importance of the critical way of thinking in nursing

Nursing is basically considered a trade as nurses have to apply the academic knowledge obtained through training in practice.

More than 20 years ago Capper (1978), suggested that nursing knowledge should be classified according to the following: empirical knowledge (the basics of nursing as a science), aesthetic knowledge (which makes nursing an art beyond the discipline), ethical knowledge (the moral basis of knowledge) and personal knowledge (see figure 1).

Nurses work with various facts and knowledge when looking after the healthy client or the patient suffering from a disease. The most important sources of practical knowledge are summed up in Table 1.

When making practical decisions related to the health care provided for the patient, nurses still most often rely on, beyond the academic knowledge, the empirics - that is on others' or their own experience, on the results of simple observations – and on traditions. National and international surveys have been carried out about how nurses' acquire their essential knowledge and skills As a result of a survey based on 600 nurses' questionnaries in Canada (ref 1999) the following results appeared:

The most often used source of knowledge was the experience of their own gained through nursing patients, this was followed by the knowledge gained in nurse education, followed by the sources available in hospital units (standards, professional guidelines, instructions, protocols, further training) or knowledge obtained from colleagues. The knowledge coming from relevant professional literature was among the last ones, it was preceded in the order of importance even by intuition and the routine gained during the years spent at work.

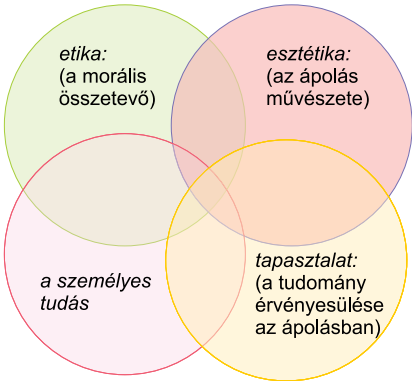


Figure 1. The basics of nursing knowledge

Table 1. The most important sources of practical nursing knowledge

- The experience gained by the nurse through nursing patients
- The knowledge obtained through nurse education
- Medical and nursing professional journals
- Articles, journals on the results of medical and nursing research
- Professional books
- Professional courses, contunuing professional development (CPD)
- Professional conferences, exhibitions
- Devices, equipment, manuals of technologies, guidelines describing processes
- Professional protocols are the list of events and activities necessary for the performance of actual performed health care, patient management, by taking into account the professional guidelines and recommendations of letters of methodology.

E.g.

The professional protocol of the Ministry of Health
Professional Ulcer risk assessment; its prevention and treatment
Nursing care of cereral vascular accident
Prevention and treatment by artificial nutrition therapy of malnutrition accompanying illnesses
Enteral probe- nutrition (valid :until 31.12.2011)

Made by the Professional Board of Nursing

- Nursing professional guidelines might help to strengthen native evidence based nursing as well as put everyday nursing into practice. Unfortunately, few professional guidelines are provided to solve nursing problems.

E.g.

The professional guideline of the Ministry of Health
For the physiotherapeutic treatment of female patients suffering from stress incontinency
Made by the Hungarian Curative Gymnastics Society
(valid: 31/12./011)

- Local descriptions of procedures: the systematic list of activities necessary for the performance of a nursing medical treatment. As professional guidelines have been made only for few nursing activities, the local descriptions of procedures meet the demands of the professional rules but they are not or only slightly supported by scientific evidence.
- Information gained from other nurses and professional colleagues
- Professional discussions with doctors
- Nursing intuition during the treatment of the patient
- Media

Similar results can be seen in Hungary. On the data of the Tutorial Hospital Library of Zala County, it can be seen from the results of a survey completed in 2000 that only 32,5% out of the nurses with a degree in the Hospital of Zala County sought data from the OLIB Web View data base, while only 0,4 % of them asked for data from the data base of the ProQuest Medical Library. According to the survey the target of the research for professional literature most often is to prepare for professional lectures, the aim to solve the problems of daily treatment/health care of patients was revealed only in about 11% frequency rate.

The above mentioned results encourages us to think critically, because the examinational results, observations which are published in scientific professional journals and are revealed to the significant representatives of the profession, giving information about the stages, methods, strengths and weaknesses of the research process, making discussion possible for the professional representatives in a broad sense, can be considered fairly well-established.

We have to admit hat even the facts thought to be evident can change and fail. Probably our essential anatomical, physiological knowledge can be relied on for a long time but the facts, criteria in several other fields can lapse. This problem is highlighted in an announcement published in a professional journal of Scientific and Technical Information library- and information science , which reveals the activity of a clinical librarian working in the medical centre of the university in Amsterdam. The librarian is in daily contact with doctors and informs them about what problems must be solved by the help of professional literature. Following this they search for 4-5 relevant articles in Medline and further data bases and the very same day the doctor gets the information that may help him to make decisions in connection with therapy.

In the USA, for example, there is a judicial leading case when a doctor was convicted because he had, prescribed a pregnant woman anti-convulsants, which had an embryo damaging effect, without checking the relevant pharmaceutical information, a fact that had already been proved by the relevant professional literature in about 150 articles by that time.

Therefore to use academic knowledge obtained through training in practice, it is indispensable for them to follow the latest information and facts continuously by studying the relevant professional literature.

What we accept out of the results of examinations and research as proof of evidence, we have to be aware of the viewpoints controlling the assessment of scientific results. The primary condition of this is the acquirement of a critical way of thinking.

In the following chapters the academic and practical viewpoints of the assessment of studying scientific professional literature and its examinational results will be summarized. Special emphasis is put on the services and applied practice available in Hungary and at the University of Pecs – being this the work place of the authors of this chapter, however, the authors aim to summarise academic and practical knowledge which can be applied irrespective of the institution or the county.

The mapping of previous researches (literature research)

Scientific research is a process of the solution of several tasks built on each other which is described in detail in the chapter of Research methodology.

In this chapter we will concentrate on literature research and its stages. Emphasis is put on all this from the process of scientific knowledge because today's researcher can select from a much broader spectrum of scientific articles than a decade ago, as new sources can be applied in which the availability and application of electronic data base and libraries have an outstanding role.

Scientific research is based on reliable, relevant literature research. Information must be obtained about who has written it, where and when, methods utilised, what results have been achieved and what conclusions have been drawn in the chosen topic.

Conscientious and precise literature research can promote the prevention of several problems e.g. research performed by an inappropriate method, or the examination of a problem which has already been clarified by other research which renders the examination of the topic from the aspect planned as out of date.

How to start?

The starting point of regular literature research can be:

- the traditional card catalogue of any library
- electronic catalogues (OPAC) available offline or online
- professional data bases available offline or online
- electronic libraries
- national bibliographies
- professional bibliographies

Before the student or researcher sets out to collect literature, a system of collecting information must be formed so that the source of information can be reached later on (for example with the purpose of reference), some basic principles should be taken into consideration.

Preferably, notes should be made in a word processing program as they can be classified and divided into groups optionally later on. If computers are unavailable at this phase of the process, it is advisable to make notes on small cards for the very same reason (e.g. topic, the year of being published, the author's name, the relevance of the research field or its frontier field character, etc.)

The notes regarding the given professional literature should include *(Figure 2)* the data of bibliography (Figure 2/a) as well as the name of the source where the data have been taken from (Figure 2/b).

616
B91
Jozsef Buda
The history of nursing patients and the collection of extracts from the literature of nursing. Medical University of Pecs Health Care College textbook [a] for the students at the Qualified Nursing Faculty / József Buda – Pecs, POTE, 1994.- p 282
PTE Health Faculty Training Centre Pecs

a

b

Figure 2. An example for the content of a card containing notes

Collecting data

After the turn of the millennium collecting professional resources mainly starts using online sources. Several sources can be found but the one doing the research or the thesis sooner or later gets to the library where the information can be found either in printed and/or electronic form. When researching literature, the list of resources to be used should never be regarded complete or final. When researching new information, new approaches can be found which are worth studying. It is not necessary to reveal and process in detail each source related to our topic but it is very important to select and sort them. Later on the method of searching relevant information will be described. Remember to make precise notes of the identifying data of the sources found or being searched for, so that they could be referred to later on if they are needed. On the basis of this, references can be compiled accurately and ethically.

Collecting literature

Students or novice researchers can mostly find the resources necessary for their study in the library of their institution or in a special professional library (e.g. in the libraries of hospital units). In the library the first step is to make a bibliography (making cards, see the chapter on bibliographies), then it is followed by reading, developing notes and intigating a card system . At the time the student and the researcher must be well aware of the frames of the topic to be studied. Primary and secondary sources are differentiated among the sources. Primary source is the survey and data collection performed by the researcher directly or when studying a certain author it is the study of the works of the same author. Furthermore, the materials which are not based on any other described sources (e.g. statistical surveys, publications etc.) belong to this.

Primary sources can be the following:

- *Monograph:* it is a study of bigger extent which covers a certain field or a branch of science or a concrete phenomenon in detail, aiming at a complete and comprehensive summary. It is usually published as part of a series.
- *A volume of studies:* It comprises a collection of independent studies.
- *A report of a research study, a research article:* A study containing scientific pieces of information which informs the reader and the researcher on the latest results of the research and gives detailed data about the research, partial results, measuring tools. It may happen that the detailed research report is not public.
- *Journals:* they are usually published monthly, every other month or every three months, they mainly publish scientific writings which inform the researchers continuously about the latest research, subjects of high priority, professional discussions in their special fields of interest.
- *Magazines, weeklies.* They publish not scientific writings but news, reports, informative writings.
- *Newsletters:* they are a special genre of professional, periodical publications. Mainly, they inform us about the activities of institutions, professional communities.
- *Collections of rules of law:* Journals represent the current (the latest) sources. All the rules of law are published in The Hungarian Gazette , the acts, the department orders, announcements and job advertisements referring to exclusively and directly to the sectors (branches) are published in the sectoral journals published by Ministries. Such as for example The Health Care Journal published by the Ministry of Health.
- *Theses, Dissertations:* For closing studies of higher education and for obtaining an academic degree, a written scientific workshould be written that is yet unpublished. Access to it is difficult and its use is limited. The theses that were written within the frames of higher education are accessible in the libraries of the given institution while the PhD dissertations and theses in the institutional central library, where the defense was made, and / or on the web site of the graduate school. The candidate's high-doctoral dissertations can be found at the library of the Hungarian Academy. Access to theses are under institutional control. Academic performance: presentations at conferences which can be used in our work, but a reference must be made to them, even if the presentation has not been published.
- *Professional websites:* they include the above-mentioned presentation forms. Institutions, organizations that communicate the information considered important by them, can have websites. News, reports, newsletters are published and an address book can be included.

Secondary sources are often just as important. The major part of the existing professional literature is secondary or indirect sources which present, analyze, explain or deny, complete and confirm primary sources. Secondary sources are often called handbooks comprehensively. They can be classified into two groups, reference books and comprehensive books, regarding the depth and complexity of the information displayed. Reference books serve quick, factual enquiries, while comprehensive works serve deeper knowledge acquisition.

The typical genres of reference works

- Technical Glossary: it contains the solid, professional explanations of terms, concepts, names and institutions that can be searched in alphabetical order.
- Professional dictionary: it gives a short explanation of the concepts/ terms of a special field. It can be monolingual or multilingual. A special type of it is the subject list.
- Statistics: it is a survey/ information, which is published on different levels (national, provincial) on the data regarding the achievements, results, quantities of health care.

Typical genres of comprehensive works

- Encyclopedia: basic concepts are outlined, results of a greater scientific field are summarized in an appropriate structure to meet the expectations of the special field thematically, in alphabetical order
- Manual: A systematic summary of each area of science
- Textbooks and college notes: used by students, including curriculum resource. In higher education, they are also the essential manuals of the profession.
- Literature review: The comprehensive and comparative presentation of the most recently published works of the special area.

The full knowledge of the topic requires that the researcher should be familiar with the studies, dissertations written in the given area, even if they are not widely published. This is the so-called grey literature. 'Grey literature is considered to be the non traded materials, created, printed or published in an electronic form, in small circulation by universities, research institutions, government and other bodies.'

The tools of literature research

As the first step of literature research, it is advisable to visit libraries after reconsidering and determining the topic of the research or the thesis.

Libraries can be general regarding their collection (e.g. county and city directories) and special libraries (e.g. PTE University of Pecs- Department of Health Science College Library, medical, clinical libraries).

Library catalogues

Catalogues provide access to documents which can be found in the book stock of libraries. The catalogue can be paper based and in electronic format. The traditional paper-based catalogue is a collection of cards arranged according to different subjects. From a retrieval point of view the catalogue may be of different types e. g. letter normal professional, series, date, etc. These types of catalogues may be relevant if the library's holdings are not entirely revealed in the electronic database. In major libraries, electronic catalogues have taken over the role of card catalogues so the user cannot really see them. The advantage is that there are many aspects of retrieval through which the library's holdings can be revealed for example that the document exists on the directory where you can find the amount of copies, what the status is (whether it can be borrowed or used on site only). Later on the electronic catalogue of the Library of the University of Pecs will be displayed. Electronic access: http://www.lib.pte.hu/.

Electronic catalogue
(OPAC=Online Public Access Catalogue)

The OPAC is a computerized catalogue which is public, anyone can access it directly, usually for free. The advantage of OPAC is that it can be used in an unlimited time and space, more people can have access to the same data and information at the same time. The OPACs are always based on the integrated library system used in the given library. Therefore their interface can vary.

How and what can OPAC be used for?

The online library catalogue contains the documents in the book stock of the library. In the OPAC, besides the multifaceted search, you have the ability to display information important to the readers as well. A search engine or browser interface allows the retrieval of various aspects of the documents of the library.

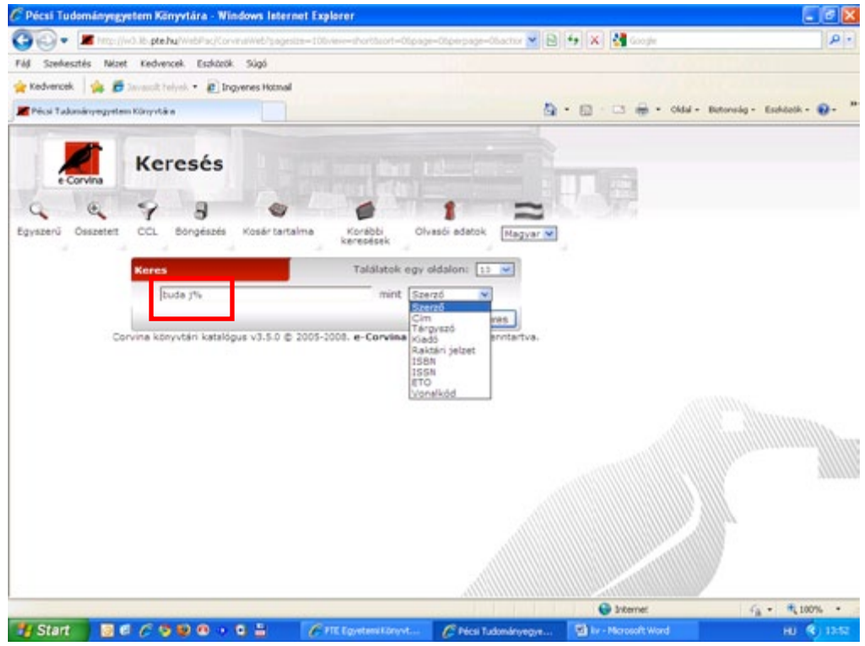
Search Methods

Online catalogues usually offer four search modes:

- 1st simple or quick search
- 2nd browse
- 3rd experienced search
- 4th advanced search

A simple search is when a particular author, title, subject heading, etc .is given (see Figure 3), it is easy to find your document if you know the exact contents of the field searched for or a part of it. In the latter case, truncated searches can be performed. Truncation is the cutting of the beginning or of the end of the character series. You can also use the dollar ($), the hash (#), the asterisk (*) marks, a percent sign (%) and a question mark (?). Most often the percent sign (%) is applied (e.g. when entering % health, healthy, health care, health etc. will also get search results).

Figure 3 is an example for simple search



Advanced searches, allow us to link more simple scans. Logic operators, so called Boolean operators should be used for linking scans in the index of the various fields. To search, enter a search term in the input boxes, select the appropriate type from the drop-down list, if necessary, adjust the release time, language, document type, and start the search with the labeled button SEARCH . (See Figure 4).

Boolean operators: clusters of terms used for linking the found piles?? during the search in the database.

- AND: Logical AND connection, so you get results that include all search terms.
- OR: Boolean OR relationship by using the search results, each containing at least one search term.
- NOT: Logical NOT or exclusion leads to results which

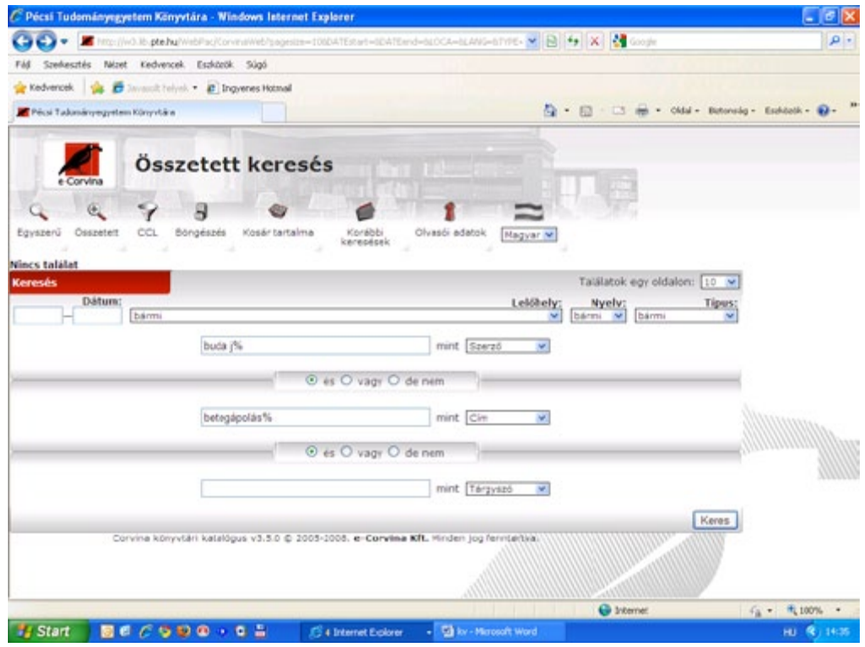


Figure 4 is an example for advanced search

contain the first marked phrase but do not contain the second.

The display of the results

As a result of the search, a result list is obtained (see Figure 5) which indicates the information only indentifying the documents corresponding to the search query (author, title, year of publication). For the display of the records found the OPAC offers several options, e.g. the amount, the details (short/long),and if the order of the results (author/title/date) should be in ascending or descending order.

The short hit list contains the information necessary for the identification of documents. Clicking the check box before the hit box, the detailed information of the location

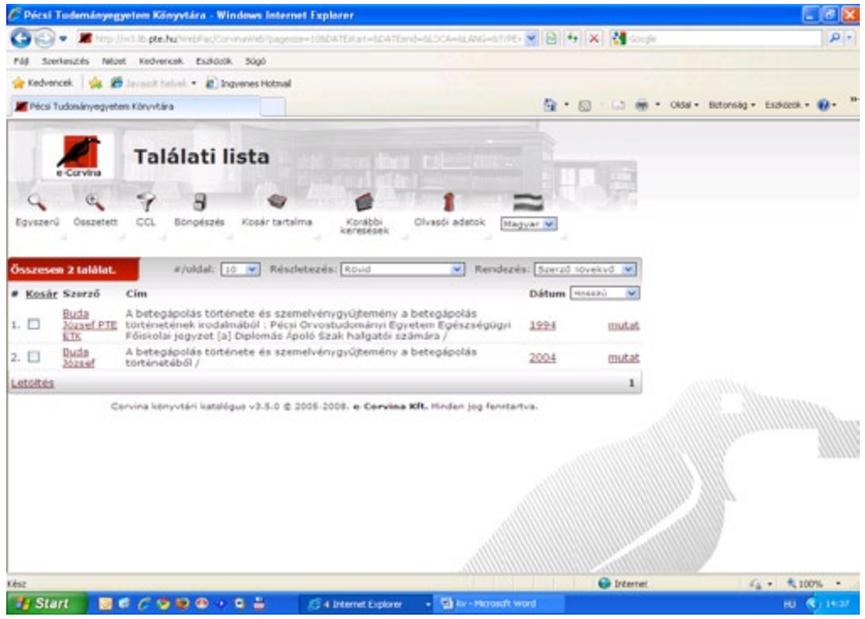


Figure 5
is the short hit list

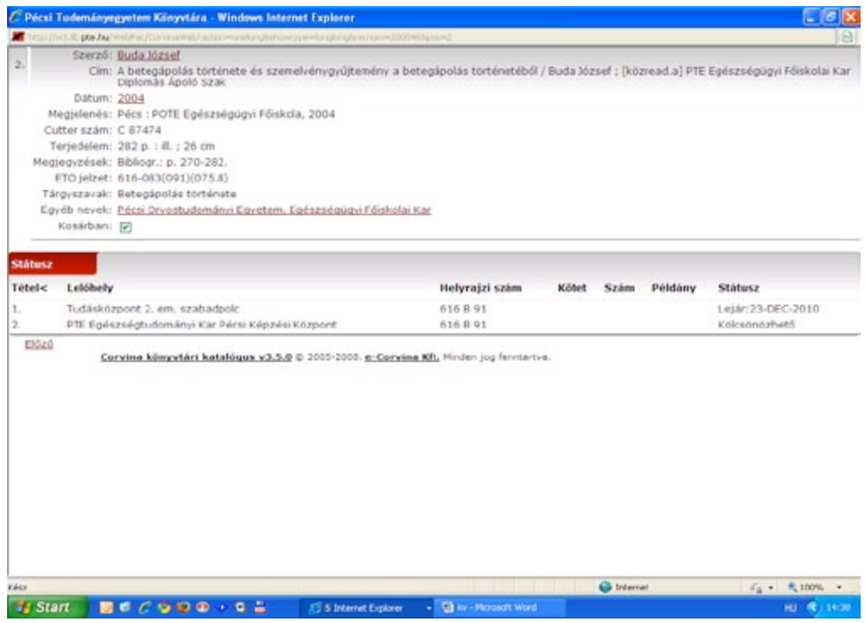


Figure 6
is the status list

(site), and whether it can be borrowed or not (status) appears *(see Figure 6)*.

The status list shows if the requested document has a copy which can be borrowed, where to find it, if it can be rented out. If you are uncertain about the spelling of your search term, if the author's name is correct or regarding the used format of the expression in the catalogue, it is possible to draw some of the indexes by a browsing method.

When browsing (see Figure 7) you ask the database to select the appropriate search terms. So we are looking not only for the author (Buda), but for everything in which the expression "Buda" occurs.

Bibliographies

When doing literature research of the thesis or research topic, we should not be content with the overview of the library catalogue, as it only contains the documents collected by the given library. It is important for us to get to know the works published around the world in the subject in question. This may be helped by bibliographies and a specialized bibliography. Professional bibliographies collect published literature of each special field and organize it independently on geographic and linguistic boundaries. Specialized bibliographies previously used to appear in print. Today, due to digital technology, this update is available electronically. During the preparation of the study, it is important to monitor the trade bibliography several times, as when writing it information relevant to us may appear.

The most important national health bibliography: Hungarian Medical Bibliography (MOB)

The Strategic Health Research National Health Policy of the national Library of Medicine processes the articles of national medical science and borderline professional journals and letters of methodology, thus creating the *Hungarian Medical Bibliography (MOB)*. At present MOB is published on the web and on CD-ROMs. Strategic Health Research (ESKI) regularly prepares and publishes the National Hungarian Bibliography which is a part of the Hungarian Medical Bibliography (MOB). The bibliography processes all the published material of the books, periodicals, academic dissertations, methodological notes, congresses and conferences. The electronic version of the Hungarian Medical Bibliography is available on this site: http://www.eski.hu.

Various aspects of database search are possible. Title, author, subject keywords, and journals can be searched. A list of 20 results is displayed simultaneously on a maximum of 20 pages (400 items). The truncation is performed by the % signal. Simple search

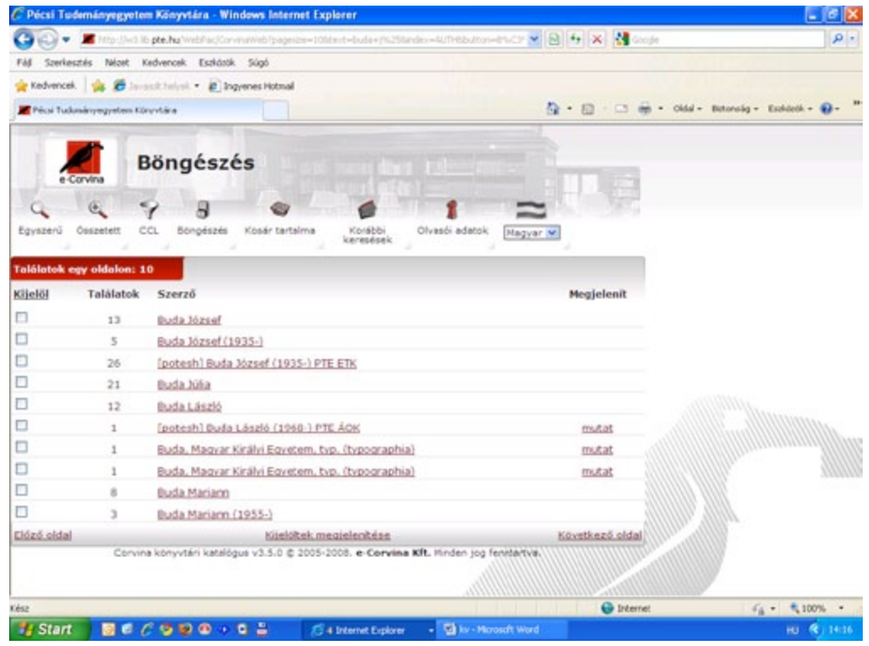


Figure 7 Browsing

A simple search using keywords and title search is recommended because the results of the bibliographic entries are displayed alphabetically by the title. There is no need to enter the article before the title (see Figure 8), as all the documents beginning with the article " A"/"Az" would be included at the "A" letter. Click on the title and a detailed description of the item and its summary (if it belongs to the item) can be viewed. You can select each item of interest clicking the check box *(see Figure 9)* next to the item number or it is possible to display the detailed description of all (maximum 20) results without summaries, (see Figure 10). You can usually mark items just on one hit/result page in batches.

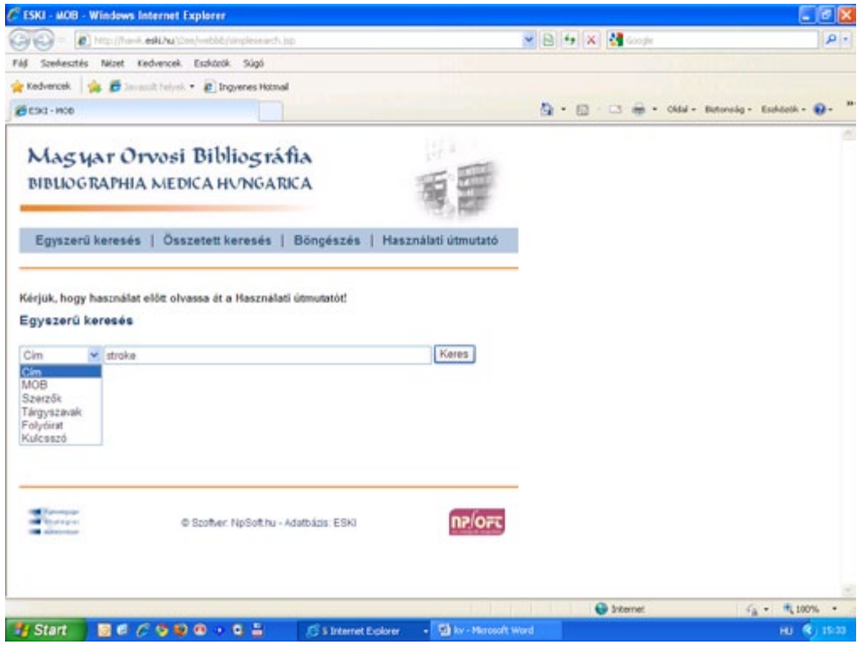


Figure 8: Title search

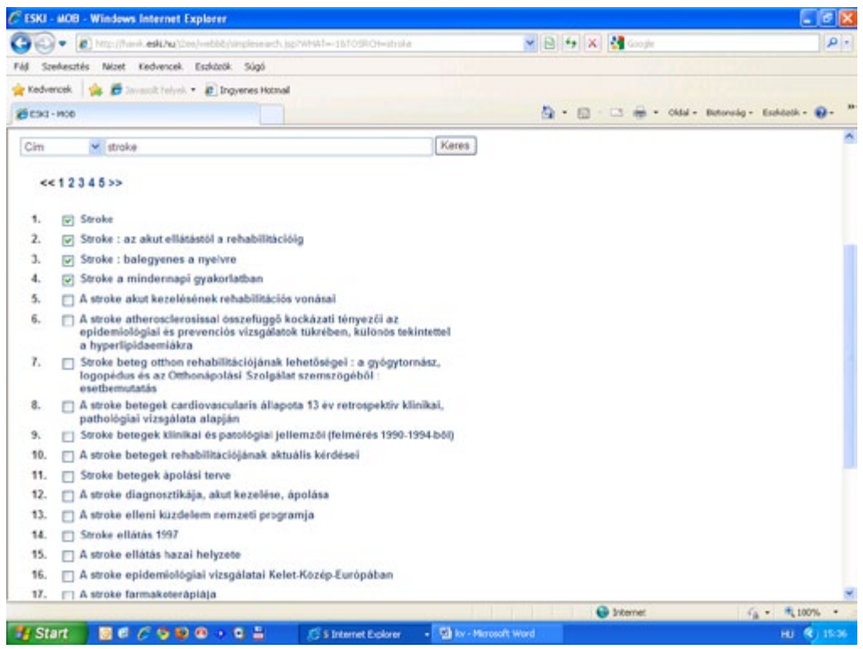


Figure 9:
An example for the hit list

It can be seen that simple and complex searches and browsing are possible, which is similar to the search in the catalogue of a library. The simple display of 20 results is performed by marking the check boxes. Only the detailed description of the ones which have been assigned can be viewed.

Advanced Search

The advanced search provides a search by entering multiple search terms. The query expressions are in logical AND relationship with each other. The display works like a simple search *(see Figure 11)*.

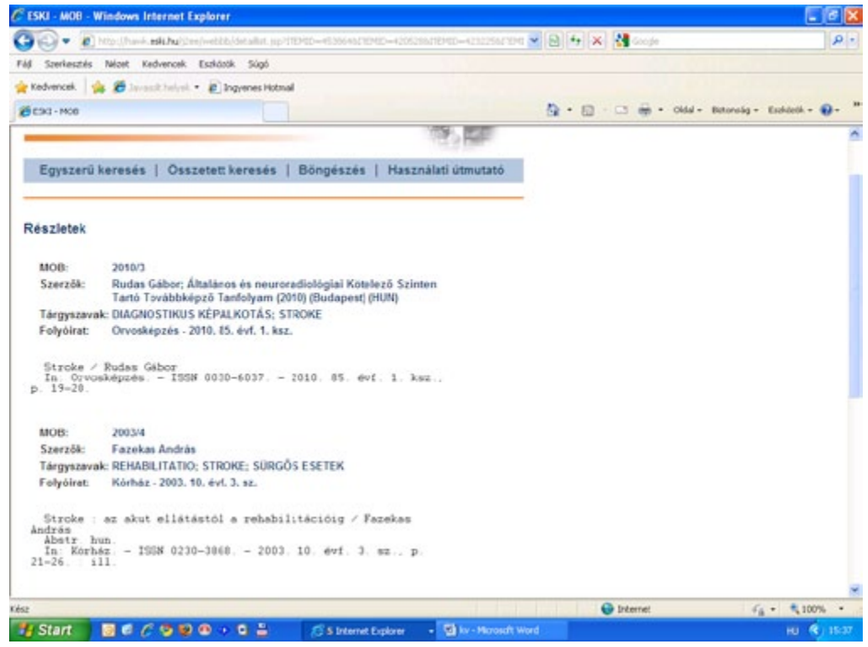


Figure 10: The detailed description of selected results

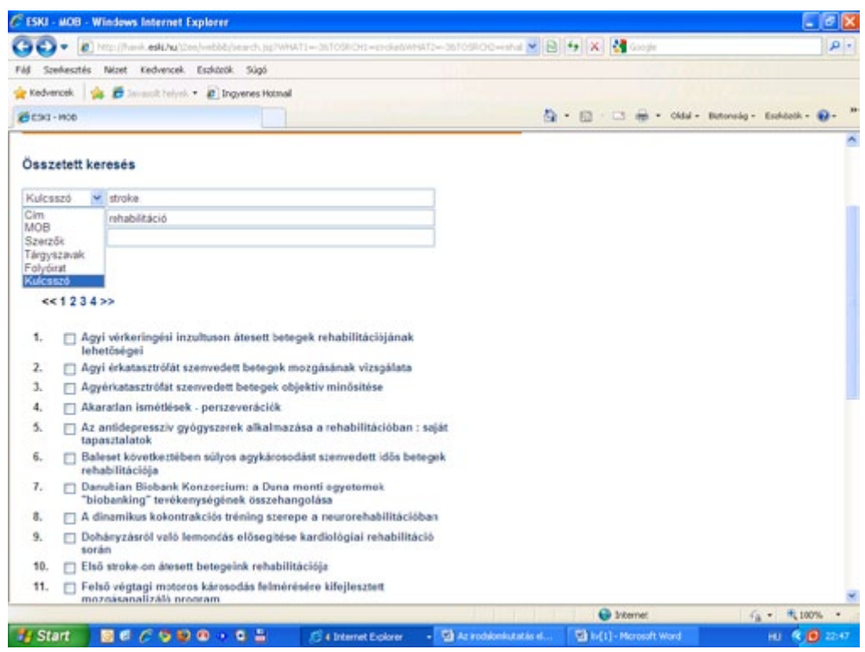


Figure 11: Advanced search for keyword

Browse

Browsing means to browse in the alphabetical lists according to MOB book number, author, subject headings, keywords, and periodical titles. The associated items can be seen by clicking on the hits in the search listings.

Search by author:

If you know the author's full name, it is worth entering the first and last name as well. If you are not sure of the author's full name, you can just type the last name or some of its characters. For example, if you enter the author's search box to "Kis", you will get the bibliographic item of the surnames of all authors with "Kis" (i.e. all Kis, Kiss, Kisbenedek, Kissik, etc.) that is as if after Kis the % sign stub had been copied. If you do not know the exact name, you may want to choose the Browse search mode. Here, we get only the names behind which we get the results. Search by subject heading. Subject heading: A word revealing the content of the document professionally selecting it from the subject vocabulary of the Hungarian Medical Bibliography in alphabetical order.

If you do not know the exact subject term, you may want to choose the Browse search mode. Here, we get only the subject words behind which we get the results/hits.

To search for journal title

If you are looking for specific journal articles, you may want to choose this search.

To search for a keyword

Keyword: an inflected word in the title, subtitle and in the extract of the document as it appears in the original document.

Offline databases

These include local storage sites (CD, DVD, hard drive). Their use is not dependent on network speed, but they often require more complex, more detailed resources (hardware, software). Online or electronic databases have the advantage that they contain the latest information. The advantage of online and offline databases opposed to paper-based bibliographies is that it is easy to update them and the retrieval can be of many aspects. Such material is Repetitio Anatomiae/ Anatomy training CD, which provides help to acquire basic anatomical knowledge. Vajda, Dr. John and Csányi, Dr. Charles process the anatomy of the human body divided into 25 individual topics. The CD-ROMs contain high quality colour images, the same number of drawings of 554 original specimen/drafts, 5344 for nomenclature terms, and more than 9 hours of explanatory audio material and related written text.

Internet search

Search engines and search engine programs make searching online easier and they provide services on very similar interface to the databases. Searching the Internet for professional and popular literature searches is wide-spread as well. In all the internet search engines it is possible to use advanced searches as well as a simple search. Not only can one expression be entered on the search box and offered on the simple search interface, but also search terms linked to logical operators (Boolean operators). Internet search engines – as opposed to the database – do not process all the sources according to uniform criteria, information is taken directly from internet sources. Internet search engines do not contain standardized subject headings, search engines search on the basis of complete texts. During the research it may also be useful to perform searches for synonymous terms of the subject words. They present the information which can be found on the website like a table of contents. The information that you are interested in can be selected from among the immense amount of information and not systematically by the help of earch engines which help us pick out the relevant one. Search engine examples:

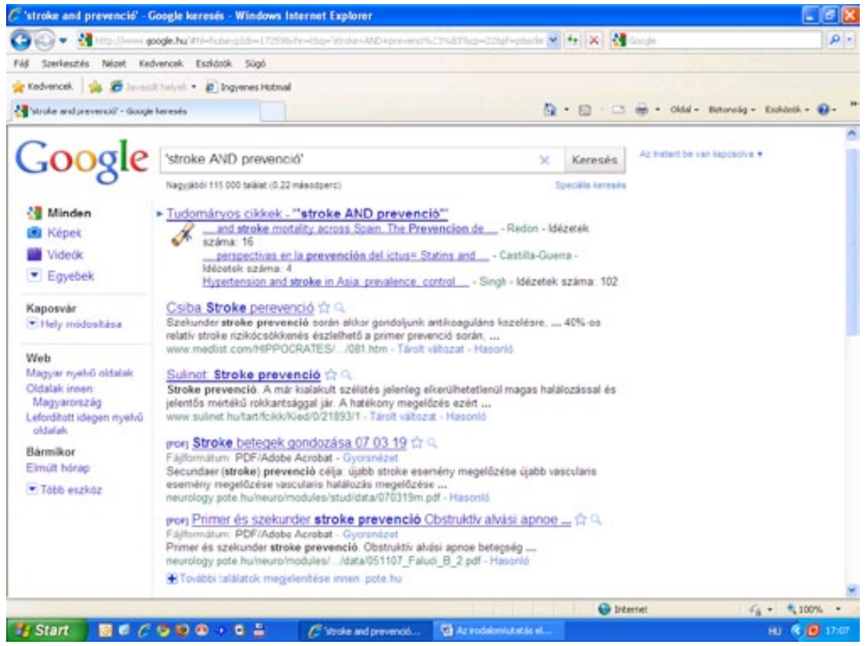
- AltaVista (http://www.altavista.com) and its Hungarian version Altavizsla (http://www.altavizsla.matavnet.hu)
- Yahoo (http://www.yahoo.com).
- Google (http://www.google.com). The websites where the search can be continued are usually blue in color and underlined, marked this way on each page. These are the so-called links. Browsing the results, takes a relatively long time to find the item we are interested in.

The use of Boolean operators increases efficiency during the use of Internet search engines. The search postulates AND link between each word we have entered in case of a simple search. Therefore, every page will appear as a hit/ result on which we get all the terms we have entered, even independently. Therefore, if you want to search multi-word phrases, names, the excess number of hits can be reduced if the "exact phrase" (exact phrase, genaue Wortgruppe) function is used, because you get only search results when the words are next to each other, in the specified order. If you get too many results, narrow down your search or choose advanced searches. If no match is found, you should try new words, synonyms or perhaps different search engines.

Unpublished literature

The basic sources of theoretical research are the printed documents. The scientific value of the documents which have not been published is also important. These include dissertations, research reports, survey results, but also the documents guarded in the archives of institutions, clinical departments. These documents may contain important information about the chosen topic to be written. Documents, oral and written material of literature gathered during the research can be used in many ways.

Figure 12: Search by the help of Google



Reference

No single thesis or research can be imagined without the bibliography.

A thesis contains two types of bibliography:

- List of references
- List of literature used.

The reference work for all scientific writing is an integral part which also provides information about the author. The documents appearing on the list reveal in what literature the researcher found the information which they literally refer to and found necessary to the dissertation. All the references may imply the depth, the extension of the specified subject the professional researcher worked with.

On the basis of the literature used we can conclude how authentic the author is professionally, what he considers current and new materials . Depending on the subject the nature of sources used can be very different.

A variety of resources can be used in several ways.

- as literal quotes
- as content summary (paraphrase): it means that it is not literally quoted, but the author's thoughts are given back with reference to the source in the researcher's own words.
- facts and theories are set outlined.

When quoting literally, always put quotation marks with the quoted text. The quotation marks in the quote are to be done at the beginning and at the end as well. A hyperlink of the page number of the cited text in the source document must be clearly stated in the reference.

Content adoption, summary is called a paraphrase. This means that the researcher of the thesis summarizes another author's thoughts. Efforts should be made to take them over as accurately as possible, and to lead the train of thought with this in mind. In this case, references should be made in exactly the same way as in the case of the literal quotation.

The works used for writing the thesis must be referred to in all cases. The reference is to allow the publication to be clearly identified or the location of the extract or the thought to be determined, and that the form of bibliographies and reference types should be consistent. Always refer to the original source! (If the original source is not available, make a reference to an intermediate work, and through this, the original source.) This is called an indirect reference. The appropriate reference has formal rules that are part of the chapter we present. On the grounds of the reference the source must be clearly identified and the source must provide sufficient information to readers for further search. The reference preparation is facilitated if the student and the researcher work accurately and consistently when making notes and gathering resources that is they have precisely written down all the identifying data of the books and documents used.

If this is not undertaken, at this phase of work the original materials and documents must be looked at again. It is important where books are concerned, that data should not be copied from the cover of the book but the inside page because it contains more accurate information. If you cannot find some information on the internal front, or you are unsure as to which data is to be copied, see the catalogue or ask a librarian. Making a reference has formal rules, the two most commonly used methods are the following:

- "name-year method" (Harvard system) (e.g. Buda, J. (2004): The history of nursing and a collection of extracts from nursing history. Pecs POTE Medical College, p. 282)
- numbering method (e.g. 1. J. Buda: The history of nursing and a collection of extracts from nursing history. Pecs: POTE Medical College, 2004. p. 282)

The reference in the text can be made by the method of either the Harvard system or by the numbering method. If the Harvard system is used, the list of references comes at the end of the thesis and its bibliography entries follow each other alphabetically by author. If the numbering method is selected, the list of references comes either in the footnote or end note, the items in both cases follow one another in ascending order. 'The methods differ in two main things:

1st The methods and routes of retrieval of information are different (in the first case it is according to the author, in the second case on the basis of the order of numbers).

2nd The method of sorting the items which provide information about bibliographic data of the works cited is different (authors in alphabetical order, or reference number order).

Whichever system is chosen, it is important to be consistent, that is the same paper should not mix the two systems. The lack of reference or an inappropriate one may cause many problems.

- • It will not be credible what you write. You violate the rules of science namely that the data and conclusions should be justified and verifiable.
- • Your thesis or scientific research will not be accepted or published in scientific forums.
- • People showing interest in it will not find the original material.
- • You commit plagiarism, that is the results and thoughts of others are communicated as your own thoughts, which may involve legal consequences.

Plagiarism is the disclosure of other authors' thoughts, presenting research results without quotation marks or reference, thus communicating them as your own thoughts and results. The failure of a link or reference to an important thesis overlapping the content of the given work is considered plagiarism in case of scientific communication.'

Summarizing the literature used, making a bibliography

Reference: the source assignment of the literal and content quotation in the essay

Literature used (list of literature): the list of sources with exact bibliographic data which contain all the works which the author of the thesis used. The bibliography should be placed at the end of the essay.

Bibliography is, on the one hand, an independent volume, on the other hand an overview which is more systematic and detailed than a list of literature and it is related to a book. The bibliography is a systematized list of literature placed at the end of or in the notes of a scientific work in which the author enlists the literature relevant to the work. Extensive bibliography can be up to individual volumes, but in connection with a book it can be put at the end of the work, or in the notes to the scientific work.

Standard MSZ ISO 690 (in force since 1991 in Hungary) is the standard for bibliographic references and refers to the form of bibliographic references. MSZ 3424/1-78, Bibliographic description Books Standard refers to bibliographic description. The regulation regarding the order of references in various institutions of higher education may be different. The essays of the Faculty of Health Sciences, University of Pécs must be written according to the no. 5 / 2008 Dean's statement (insert ref). All the sources used in this work must be included in the bibliography, not only the works from which verbatim quotes are used or those that have been referred, but also the those that have been read.

The order and the form of bibliographical items:

- At the end of the work the bibliography is normally to be displayed in alphabetical order.
- The same data should be presented from each source (see below), in the same order, with the same punctuation.
- All authors are listed alphabetically by last name basis. The author's first name is either printed out and / or the full name is listed in the bibliography, the way it is used in the document.
- Spelling/writing valid for foreign authors is applied to the work of Hungarian authors in foreign languages e.g.: Buda, B.
- In the case of foreign authors the author's last name should appear first, and separated from it by commas, you should put the complete or shortened first name. There is a space between the first names, e.g.: Golub, S.
- Citing several works of the same author include ordering according to letters, that is the titles of the works must be put in alphabetic order.
- If the work has more than three authors, only the first in order is expected to be named, the rest of the names are replaced by et al. (meaning 'and others') e.g.: Bodo M. and others; Miklos Bodo et al.
- The names of the authors of the publications should be presented with details in the same way as it is in the work. Their academic grade or rank such as MD, PhD, CSc, etc. should not be presented.
- If there is no obvious author, the editor's name must be put in front of the title, and their function in parentheses after their names, e.g.: Kiss, J. (Ed.).
- If a book has multiple editions, and it is not the first edition that is used as a source, the edition number must also be included after the title of the work, for example: 2nd Revised edition.
- If the referenced work release is unknown, " sine loco" = [s.l.], i.e. "no place" abbreviation is used at the appropriate place of the link.
- If the publisher's name is absent, an indication of the "Sine Nomine" = "anonymous" or the equivalent [s.n.], [n.n.] can be used.
- If the time of publication of the referenced work is unknown, "sine anno" = without "years"[s.a.] is indicated at the place of the year.
- According to the official view, the indication of the scope of the book, or the number of pages is optional. If the number is indicated, however, it can inform the instructor, and the reader of the amount of processed literature. The number of pages can be written after naming the publisher. After the number the letter "p" (pagina: page number in Latin) should be indicated.
- The articles should not be included in the alphabetical order.
- The dates in case of online sources must be indicated by giving place, year, month and day.
- The Acts traditionally have Roman numbers, all other laws/ legal rules are given with Arabic numbers. The sources beginning with numbers come at the beginning of the alphabetical order. The form of bibliography and its presentation according to various types of documents can be found in Appendix I.

The characteristics of the search for relevant specific literature

The indicators of scientific journals and of the quality of the scientific work: citations, impact factor, Hirsch-index

The scientific journals which include detailed, accurate and up-to-date scientific information necessary for everyday work, are the most important tools of the researcher. The journal article is the presentation of research work results, however, it is the most important manifestation of scientific communication, the readers of scientific journals are not only passive recipients of the information, but also the producers of it.They are not indifferent to the quality of the professional environment (professional journals) in which the articles on the research results are published.

Professional level is characterized by two quantitative data:

- to what extent are references made to the publications released in the journals, that is, what the impact of the scientific journal on the community is like;
- how quickly scientific public opinion responds to articles published in the journals.

Citations

The number of references shows how important the article is, in that research area. It shows how important the author's articles are in that area of research. You can learn about the history of scientific results by the help of references, and by the help of obtained quotes you can learn about their scientific impact. It also means transferring information, as there is a connection between the person who quotes and the document quoted (citation: quotation). The system of the citation index, the display of being cited on the web is provided by two databases:

- Web of Science (WoS) – published by the Institute for Scientific Information (ISI)
- Scopus – published by Elsevier Science Ltd. Both citation indices referred to, collect bibliographic records, putting them not just into a set of results, but they also identify the inner links between them by the help of thematic search.

Impact factor

The impact factor is an index number, which refers to the articles but not to the scientists, and which is created on the basis of average citation. It was founded by Eugene Garfield, the founder president of the Institute for Scientific Information (ISI), Philadelphia (PA, USA). Impact factors, together with other citation data typical of journals, appeared in 1976 in the publication of Journal Citation Reports (JCR) published as an additional volume of Journal Citation. Since then, annual volumes of the JCR have been published with the impact factors of the current year – initially in printed volumes, then on microfilm, CD-ROM, and most recently in the form of a database on the Internet (only for subscribers). The University of Pecs has access to it on http://www.lib.pte.hu. The impact factor marks the degree of how often the so-called "average" article, published over the last two years in the given journal, was quoted in a given year The most highly cited ones get a high number, the less cited ones get a low impact factor number – this traditional number refined to three tenths of its value indicates the recognition of scientific journals. In the case of low impact factor

journals greater fluctuations can occur annually because only a few citations can greatly increase the value *(see Figure 13)*.

Hirsch-index

The Hirsch-index, i.e. the h-index serves measuring individual performance, but can be used for the evaluation of journals, research groups. Its creator is Jorge E. Hirsch, American physicist – insert reference. It is based on the frequency of references to works of the given author. The given author's h-index is "n" if he has "n" number of publications, which were referenced "n" times. So an author's h-index is 12 when at least 12 of his articles were referred to at least 12 times, while others were referred to less than 12. Figure 14 shows that when lining up the publications, the notice most often cited comes to the first place and the sequence of the decreasing number of citations will continue. The h-index in this case is 10, because 10 publications are shown to have been quoted at least 10 times. Of course this can change quickly, as quoting of the articles is changing, so is the h-index value. The h-index is the publication's serial number, the number of the people who quote it is at least the same as the serial number. The index cannot exceed the total number of publications. The h-index is presented by WoS (Web of Science), Scopus database and Google Scholar. The performance of two researchers can be compared with the help of h-index if the number of publications is basically different, the differences in performance can be observed even if the individuals have more or less the same number of publications and citations. However, the value of h-index can be significantly different in particular fields of science due to the different practice of publications and references in the various scientific fields.

As each database can give the h-index based on its own content that is h-indexes can be different in each database.

The Scopus database can be accessed on http://www.scopus.com . More details about the database are given in chapter "EISZ". The WoS can be accessed via EISZ. Users can have access to databases required and supported by their institutions; you can have access on http://www.eisz.hu.

More details about the database are given in the chapter of "Citations".

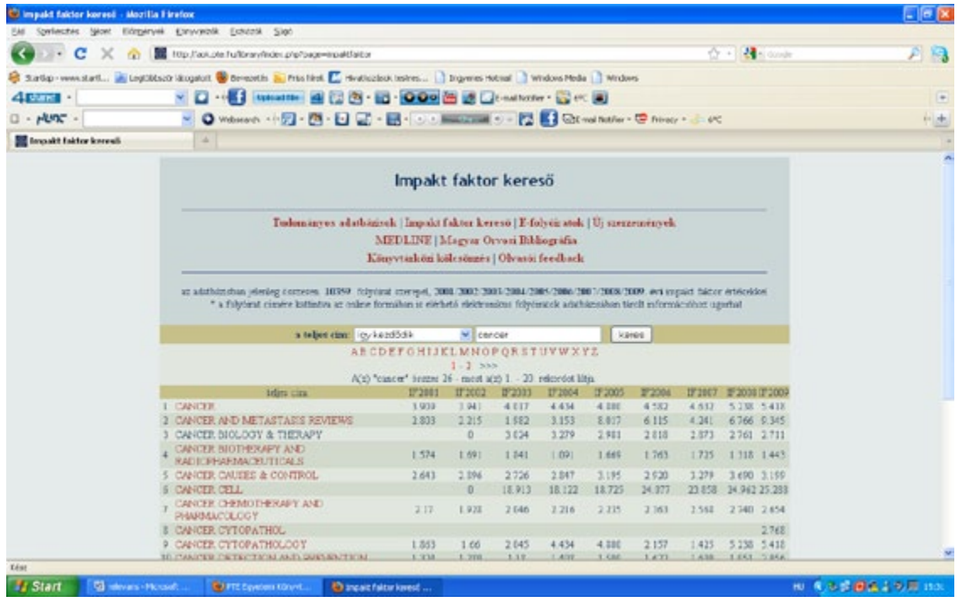


Figure 13: Impact Factor numbers of Journals

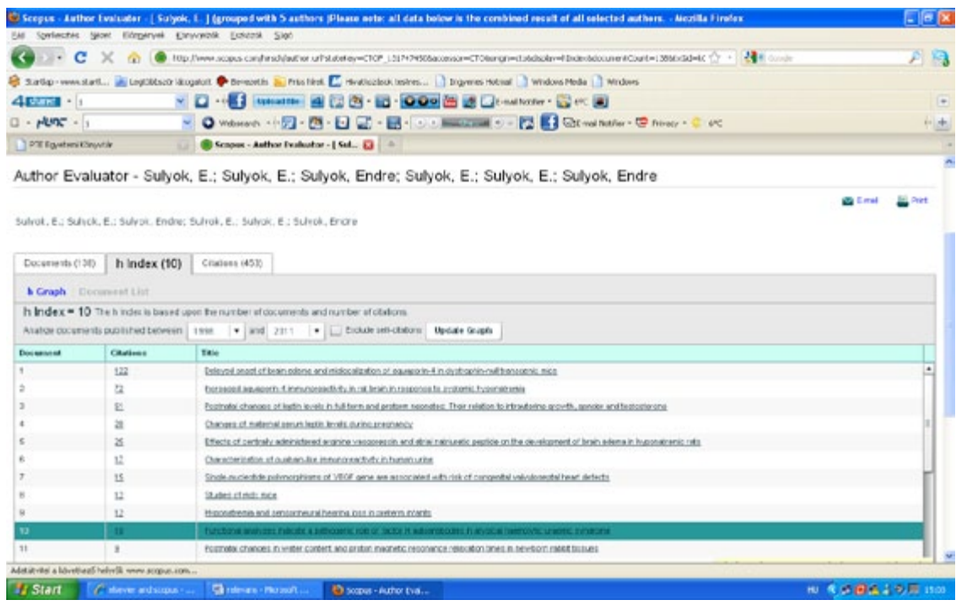


Figure 14: Calculation of H-index with the help of Scopus database

Multidisciplinary, medical, healthcare database

Before starting to search in different databases, you may want to determine the search strategy. Plan what and how you want to search for. The question should be dissected into concepts, consider the synonyms and determine if you want the aspects of search to be limited (year, language, age group etc.)

EBSCOhost

First the most common online reference service is introduced: EBSCOhost.

EBSCO Publishing provides access to its own journal article database which also contains complete texts as well as the databases of other leading publishers and information providers. The circle of databases available for particular libraries is determined by the license contract made by EBSCO Publishing. EBSCOhost is available on the web (see Figure 15) via http://www.lib.pte.hu/ or http://search.epnet.com . The database is available on the computers of the University of Pecs. The Library of the University made the home

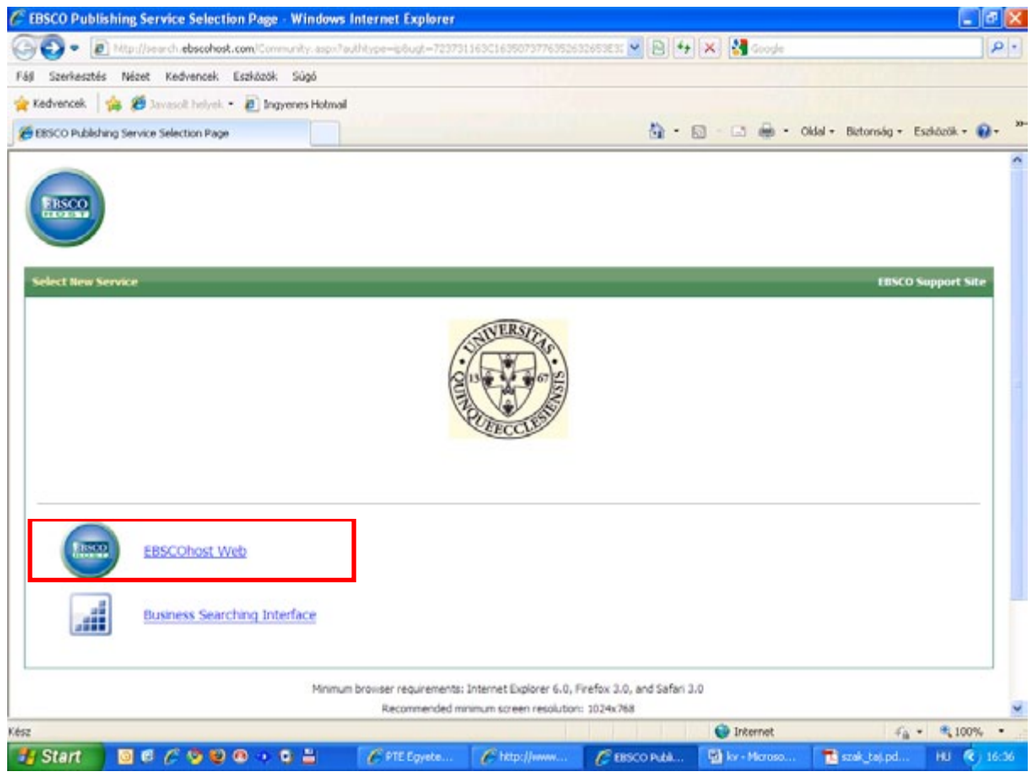


Figure15: Access to the EBSCOhost Web interface

use of the system possible for the student or the researcher. To have access, the necessary adjustments which can be found on the link http://www.lib.pte.hu/databases must be performed on the home computer. The services are available in several libraries around Hungary. (e.g. the libraries of higher education institutions, public libraries and the libraries of non-profit institutions). Searches can be made in several databases at the same time.

The detailed descriptions of EBSCO journal article databases can be found in Appendix II.

A short description of databases is available in Hungarian, so the student, the researcher can decide on what is appropriate. If you want to search a single database, click directly on the database name, or select it and click the Continue button. When you search more databases, select them from the list and click Continue. *(See Figure 16)*

Medline

The service called EBSCOhost of EBSCO Publishing offers full-text and bibliographic databases which are available free of charge on the computer network of the University of Pécs, including Medline. The most important communication tool of Medicine is MEDLINE database, which indexes articles from over 5,000 periodicals and it was created by the National Library of Medicine. The MEDLINE database is not full text, but it gives you the links to some articles. Predominantly you can search English-language indexed journals, going back to 1966. The search results in a bibliographic description of journal articles, the most important data of the records (author, title, place of appearance, time) are presented. You can search in simple and complex ways, you can perform operations with your former searches, you can set the presentation of results and save them, furthermore, profiles can be set. The complex search questions can be formulated by the Boolean search operators (AND, OR, NOT). If we do not include a 'logical operator in the search terms, the terms are searched for as a sentence by the EBSCOhost search. The sentence can be put in quotation marks as well. If you type one word wrong, the automatic error correction offers other variations as control. Truncation and wildcards can be used in cases where the word looked for cannot be fully specified (eg, multiple endings, different spelling).

- When using a search engine, the character ? is automatically replaced by another character: e.g. if the search term is ne?, they will hit one of the terms included in the results, like neat, nest or next.
- During the search performed by truncation (*), the variants of the searched terms can be found, for example if the search word is comput *, the results may include both a computer and computing words.

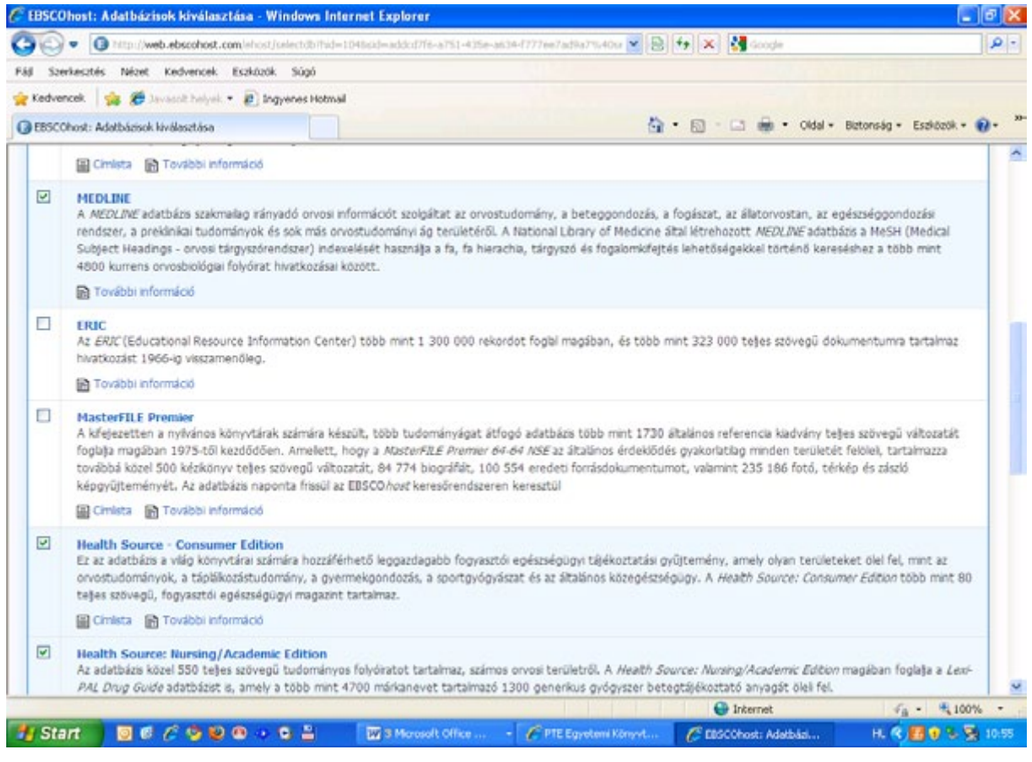


Figure 16: The selection of database (s)

The results are numbered and displayed in reverse chronological order. The results include bibliographic records (citations), reports, abstracts and may contain links to the full text. The text of the articles are available in html or pdf formats.

Simple search

The search terms must be entered into the search box (see Figure 17 and 18). The search query can be changed in the search box itself, or can be deleted by the Delete button. To start the search, click the Search button. The search options can be added, the results can be narrowed to point to full text referred to by links, and the initial date of publishing can be set.

In the list of results the most recent literature appears first, followed by the other titles chronologically. If you click on the record, the summary will be displayed as well. Click on an author, all the items can be displayed, click on the journal, you can browse in the issues of the journal. You can create a folder where you save the results and / or print them out later and / or send them electronically. A brief bibliographic description of the selected hit can be found (see Figure 19). The title of the article, the list of the author(s), the journal title, the abbreviated title, the release date, the annual number of the journal, its number of pages and the page number of the article, the database name if you have the article in pdf format, can all be seen. In the zone on the right hand side of the screen the search can be narrowed to the full text, the release date, authors, clear cut articles, fields of science, human, animal, publication type, language, gender.

PubMed

This is the world's most widely used medical database, the National Library of Medicine created it and made it freely available. It is the electronically enhanced version of Index Medicus. More than 4,800 journals are indexed by it in the field of life sciences. In addition to bibliographic data, more than half of the articles possess "abstract", and where possible, the "full text" documents are linked to the list of search results/hits to be downloaded, printed or immediately saved. The difference between Medline and PubMed is that the Medline is available on the interface of the EBSCOhost within the university network, while access to Pubmed is possible online from anywhere. However, reading the full text is only possible where academic / medical library's computers are available, with the appropriate permissions. The database is international, but 75% of articles are in English. When using it, the "Boolean op-

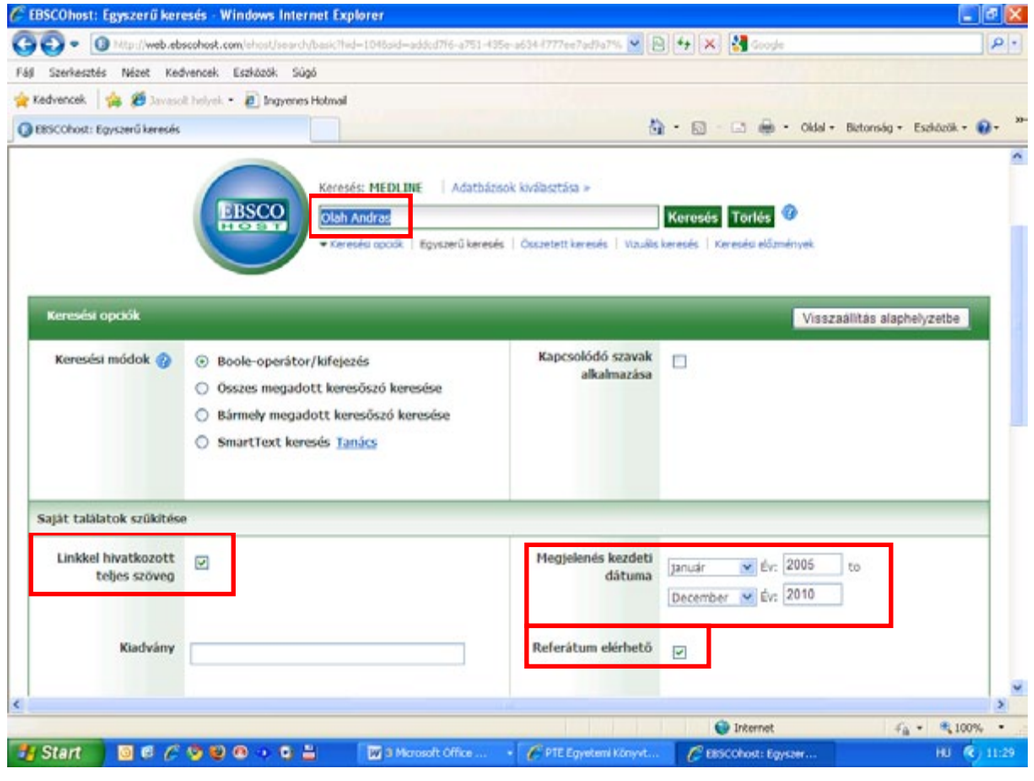


Figure 17: Setting the search options in the Medline database

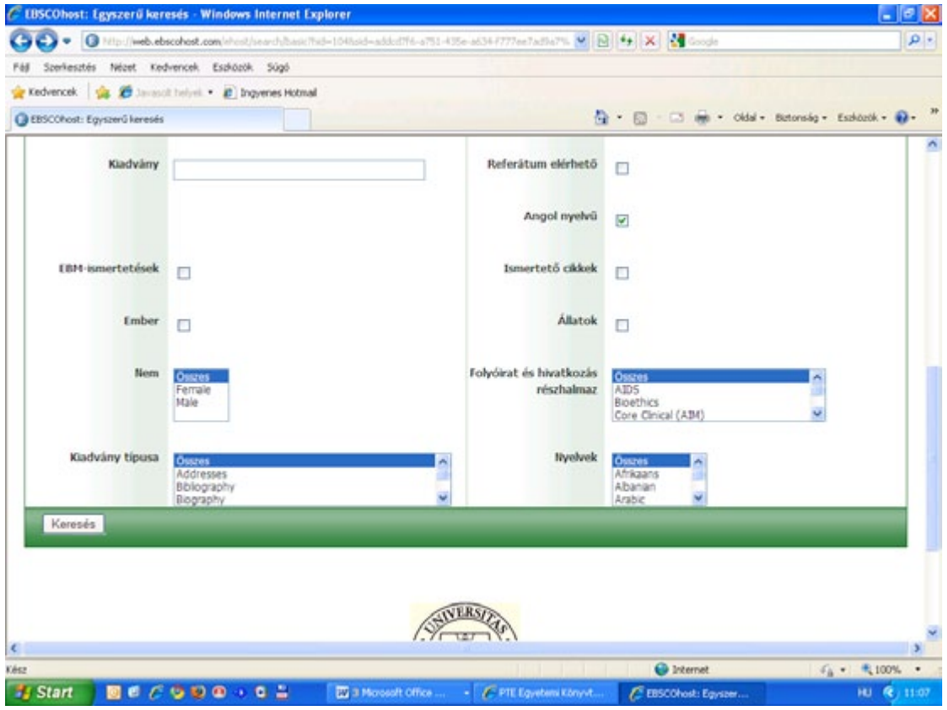


Figure 18: Setting the search options to search for English speaking full text documents published between January, 2005 – December, 2010

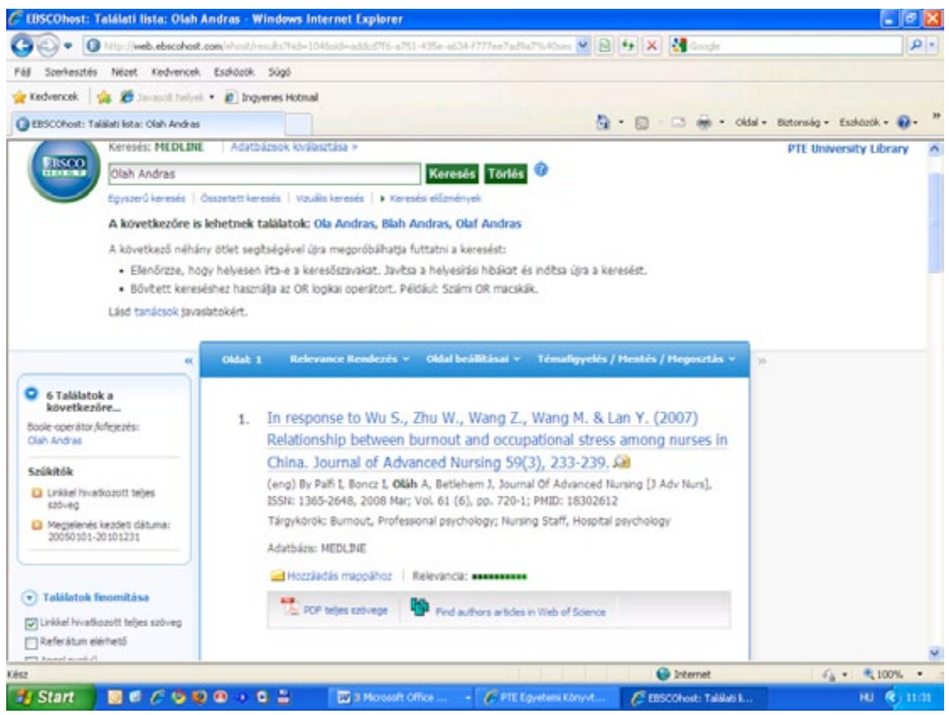


Figure 19: The presentation of the results

erators" (AND, OR, NOT) linking the search questions, must be written in capital letters. For truncation the $ (dollar) sign can generally be applied. The database is available to machines of the University of Pécs (http://www.lib.pte.hu) and to home computers (http://www.ncbi.nlm.nih.gov/pubmed).

Type the search question in the search box *(see Figure 20)*. At PubMed service there is an additional feature called the "spell check", this is an additional function that will automatically offer other spelling variations related to the given term in the drop-down list below the text entry. So spelling and orthographic errors can be avoided. An opportunity for clarification is the application of quotation marks which gets into the search technology of specialized databases from the general search engine. Further possibility is truncation, which is to enter the beginning of a word and make the search for the final versions with different characters possible. Before starting the search you can refine the search file. Clicking on the Limits (limiting / restricting) link, narrowing/limiting can be configured.

- Specify the type of article (e.g. bibliography)
- Set specific disciplines/ fields of science (e.g. zoology)
- Specify the type of journal (e.g.nursing)
- Precisely define the topic (such as AIDS, medicine)
- Set the type of text (for example full-text articles)
- Set the language of the article
- Narrow the target group of the topic of the article (for example, men and women)
- Age-selection (for example, children between 0-18 years)
- Define the type of text entry fields (e.g. author, title)

In Figure 21 we can see that we are searching in the topic of stroke therapy. We narrowed the search term to 23 months of age among children, in the last three years (2007-2010), English language, and we are looking for full-text articles.

In Figure 22 we can see that 32 articles correspond to the specified search criteria and 5 of the articles have full text. The data of presentation in this database contain only the most important information: title, author(s) name(s), publication data. Figure 23 shows that from among the selected documents in our hit list only those articles are available with full text where the Free Full Text logo or the University of Pécs logo appears. By clicking on the check box above the serial number or by clicking on the article title, the detailed bibliographical entries can be viewed. The article can be printed, you can send it in an e-mail, or you can save it onto data storage devices.

Of course, at PubMed complex searches can be done.

Click on the Advanced Search link above the search box .

Advanced searches (see Figure 24) can be done by the logical combination of various search terms. Where an advanced search is being utilised, a text box appears, the search term can be written there. The number of text fields cannot be expanded. The terms can be added to the search term by giving the text box and the type, the desired logical connection is selected, then any number of additional search terms and the associated types can be specified (e.g. author, book). Figure 25 shows that "Jozsef Bethlehem" was the name in the search box and assigned to this, the author Andras Olah. The system automatically offers Boolean operator AND (see Figure 60). Of course, you can set some other operators as well.

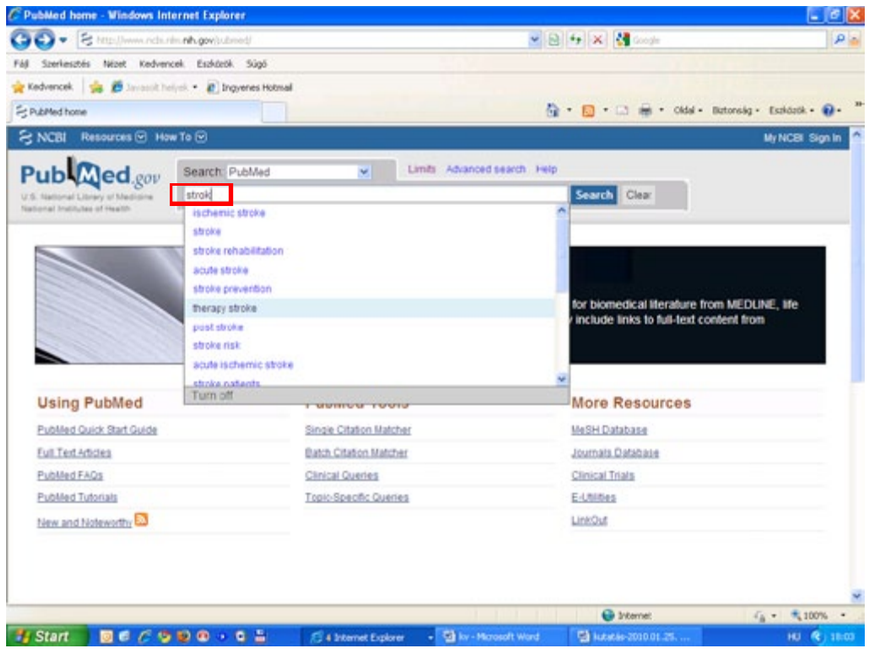


Figure 20: PudMed database search interface

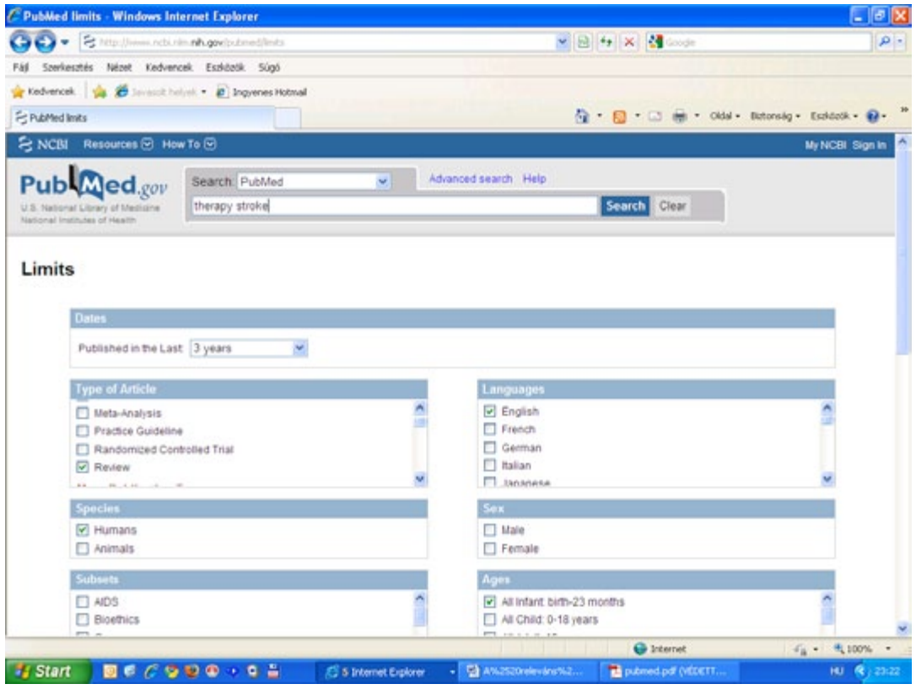


Figure 21
Narrowing possibilities in the database PubMed

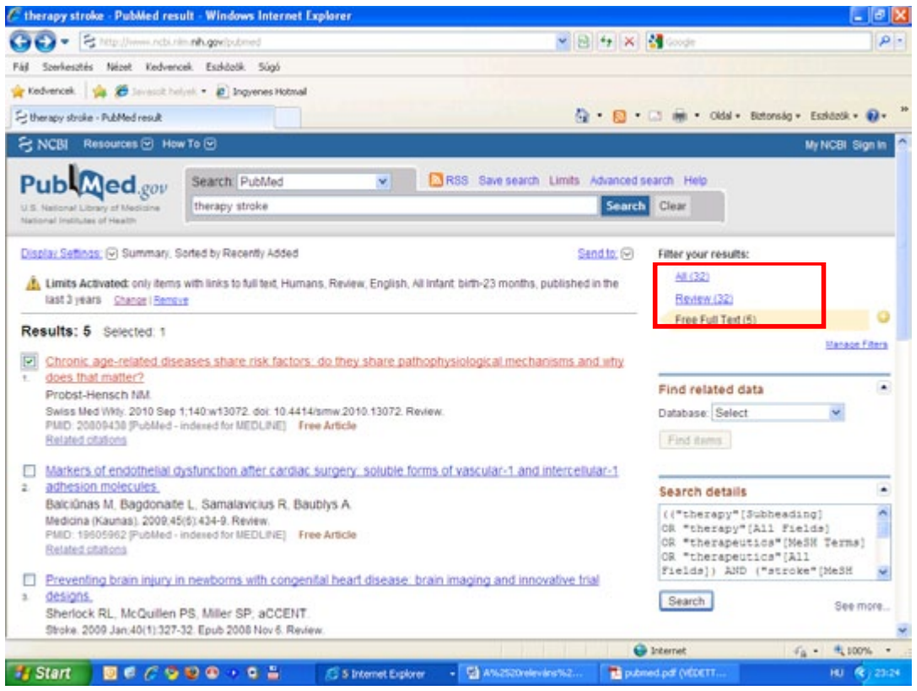


Figure 22
Hit list in Pubmed

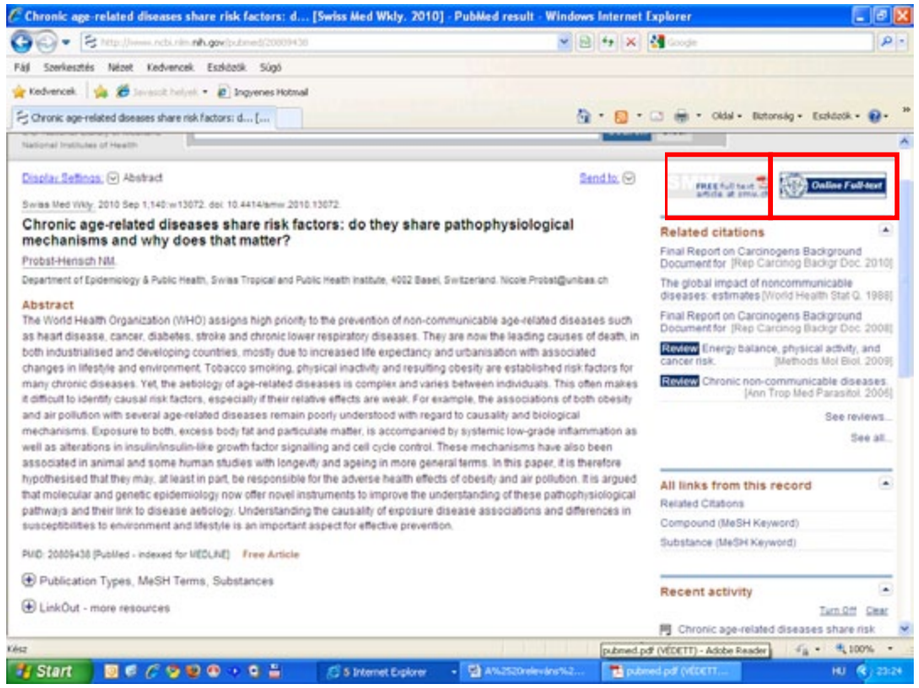


Figure23:
Viewing of the selected article

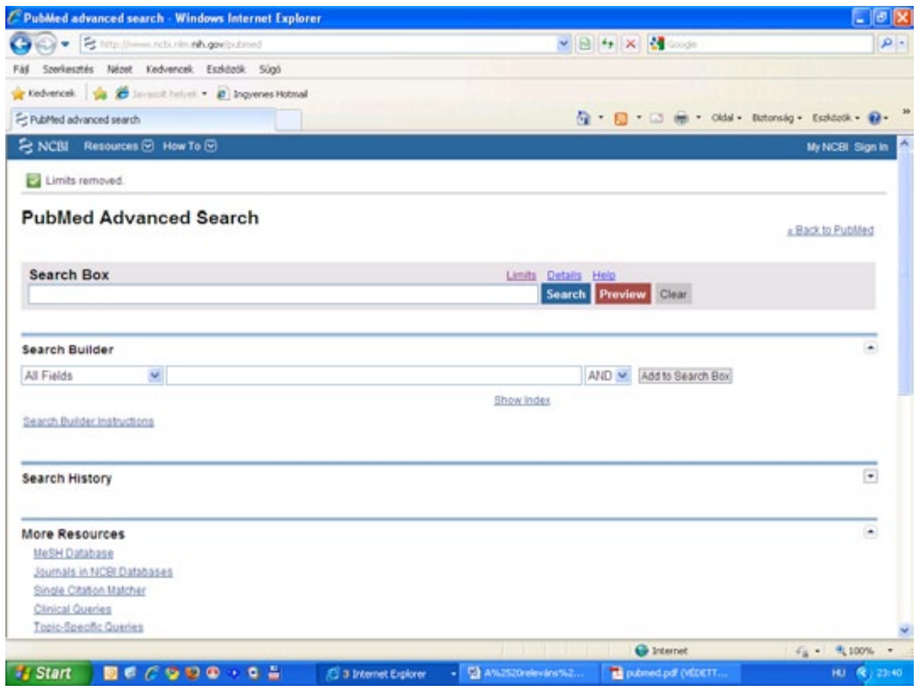


Figure 24:
The search interface of the advanced search at PubMed

When searching, the Search History line can be seen below the advanced search menu item, this indicates what, when and how many hits were made.

Figure 26 shows that in the PubMed database 8 search results are available for the authors Jozsef Bethlehem and Andras Olah, out of them one article is available in full text. The records are sorted by the date of uploading, the last uploaded article is at the top. Information can be obtained by the options on the right hand side next to the set of results. The number of all results and statements made about the Reviews between the articles, and about the number of articles with full text (Free Full Text) can be found.

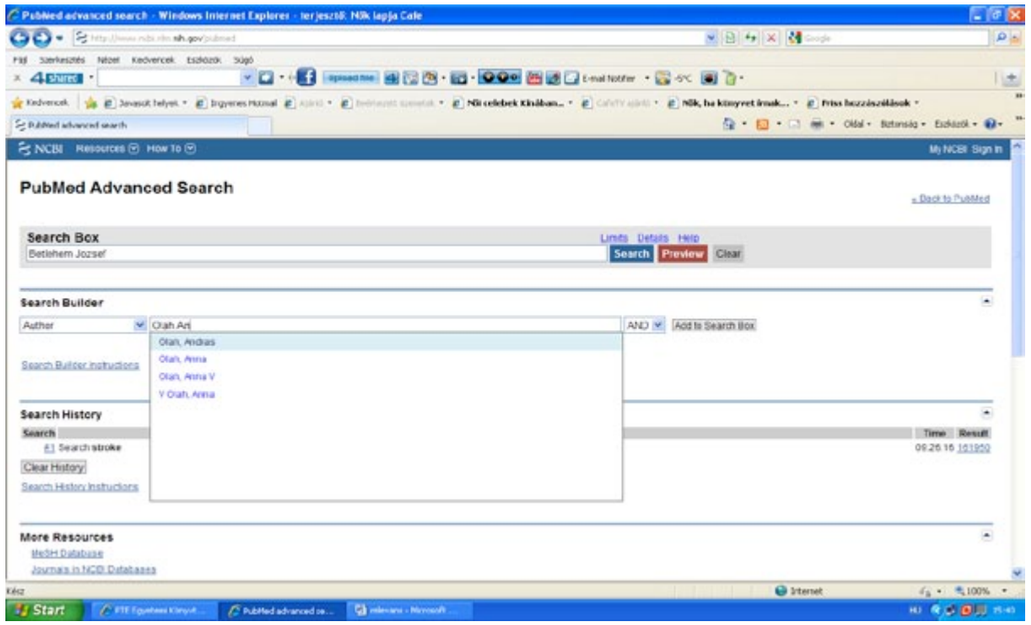


Figure 25: Author search

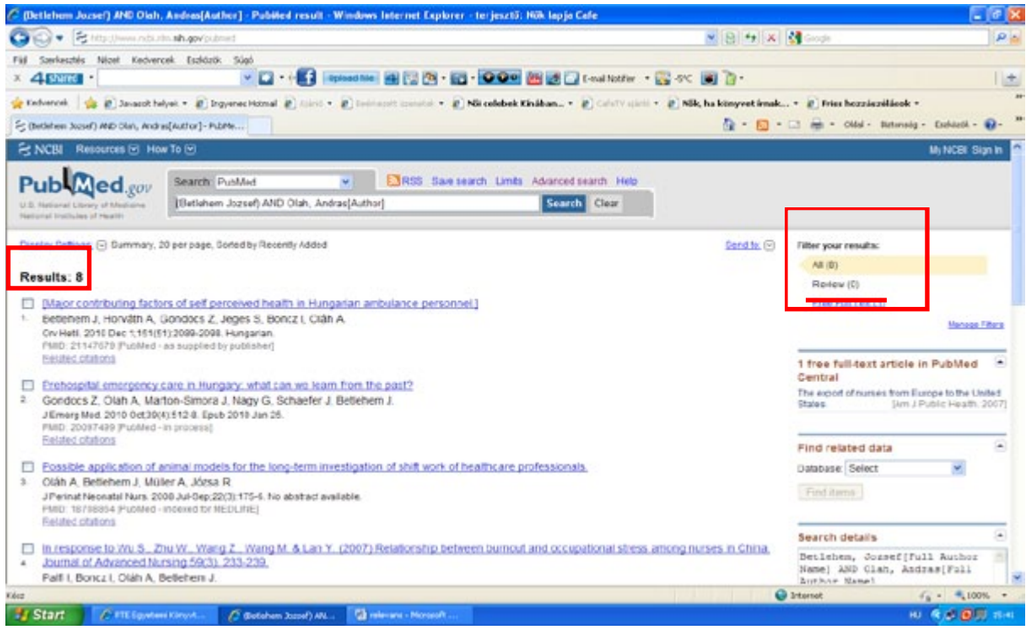


Figure 26: List of Results

EISZ (Electronic Information Service) databases.

EISZ was the national program of the former Ministry of Education and Culture which allows the use of international and Hungarian information resources on the basis of a national license for students, academics and researchers in higher education, and for the staff of scientific research institutions. Users can only have access to the databases required and where they are supported by their institutions, as the member institutions have to contribute to the subscription fee of databases available within the frames of EISZ. The database, which is a service available for the computers of the University of Pecs, requires EISZ registration. Home use can be solved in several ways if the institution provides opportunity for this by dial-up connection, by the institutional VPN connection, or through (institutional) Terminal Service access. The third option is port forwarding – this means just to have a topic number on a computer which can be achieved by the so called SSH (Secure Shell) protocol and from which the service requiring IP address can be already available. The EISZ can be available on www.eisz.hu or www.lib.pte.hu/database.

The system sends the password to the e-mail address given on the registration form. The user rules must be accepted after entering the user name and receiving a private password. Then the user is allowed to enter the system. If within six months you do not enter the system at least once, the regulation of EISZ stipulates that your ID will be automatically deleted. In Appendix III more detailed descriptions of databases in EISZ can be found.

Web of Science (WoS)

Web of Science (WoS) is a bibliographic database pack and the citation index service of ISI (Institute for Scientific Information). It is an inter-disciplinary database, which can contribute to the whole science territory by the freshness of its material published weekly.

It standardises the material according to scientific criteria and provides multi-faceted search. In its content it is possible to search for the short summaries of scientific conferences, reports, and articles as well. (Via the Internet the publication of the last five years, the archive issues can be searched and weekly updates can be downloaded onto intranet.) The citation index is exclusive to the service of the WoS which allows science metric analyses, as it also reveals the author references in addition to bibliographic data of the articles.

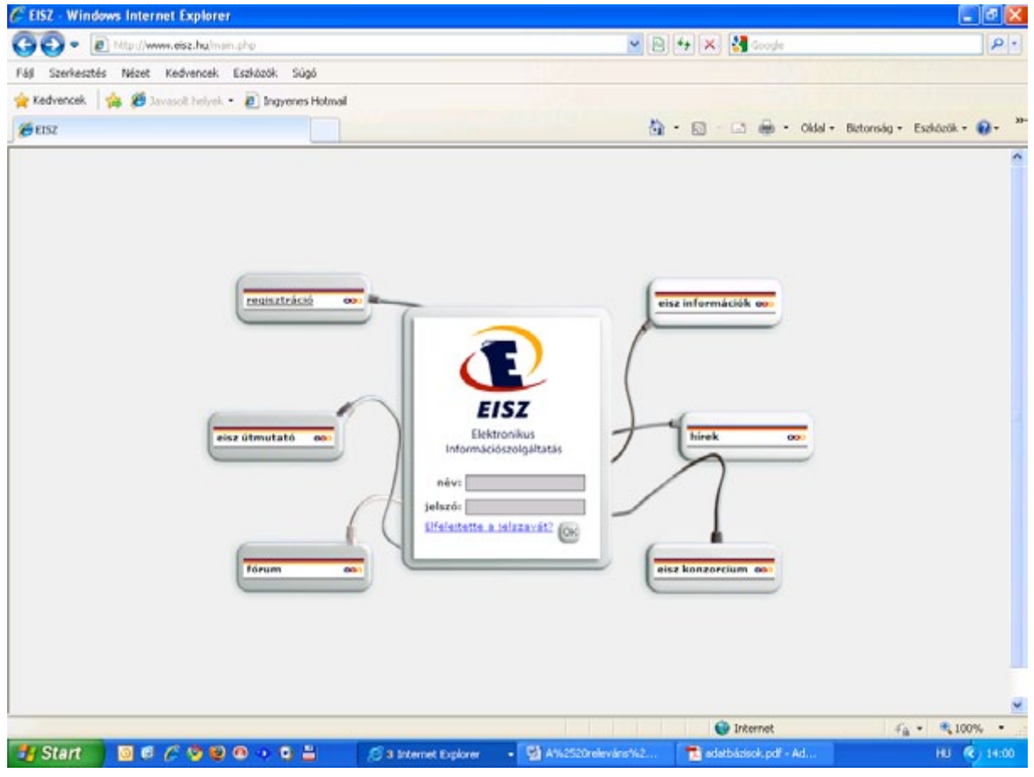


Figure 27: The home page of Electronic Information Services

There are three main disciplines at our disposal:

- *Science Citation Index:* Natural science and Technology Index, more than 5,900 journals in 164 branches are fully processed.
- *Social Sciences Citation Index:* Social Science Index, it reveals more than 1700 journals of 50 science branches and the related articles of 3300 border line periodicals are also included in its service.
- *Arts & Humanities Citation Index:* Arts and Humanities Index, more than 1,100 journals of 25 branches of science are indexed, and 6800 more are reviewed for selection purposes as well.

The general rules of a search:

- Avoid making the search queries to broad. For example: cell, behaviour.
- Both small and capital letters can be used.
- It is desirable to provide a number of possible forms of expression.
- When a phrase is in quotation marks (""), the search is for the exact phrase. The words without quotes are in automatic AND in relation with each other. For example, "heart attack" aims at different sources than heart attack, the latter two words can appear anywhere in the field to be searched.
- Banned words are common words that are not taken into account by the system when searching, for example: the, an, he, she, we, etc.

Truncation, the use of Wildcards:

- 0 can replace any number of characters, no matter where in the word, in several places (except at the beginning of the word)
- can stand anywhere and can replace exactly one character, in several places in a word
- can stand anywhere and can replace 0 or one character, in several places in a word
  - Boolean operators are used in the usual way:
  - AND (logical and), OR (logical or) and NOT (logical not). Automatically there is an AND relationship between two expressions if you do not write another linking word.

Simple search in the WoS database

In this search a topic, an article title, an author, a corporate author, a journal, and the author's workplace address, the year of release, the journal title, language and document type can be searched. By default, the three search boxes appear, but you can also add additional lines (Add Another Field). A new option is that we can connect to the Web of Science database (see Web of Science section) immediately. (Find authors articles in Web of Science), and it enables you to check the works of the author *(Figure 28)*.

You can see that in the Web of Science (WoS) database the number of articles by András Olah is 39. Figure 31 shows that the articles are in descending order by date. A short description of the article (title, author (s), journal title, publication data: volume number, page number, page number can be found. The number of references to the article (Times Cited) can be seen. In the database the author's citation index and h-index *(see Figure 29)* can be calculated.

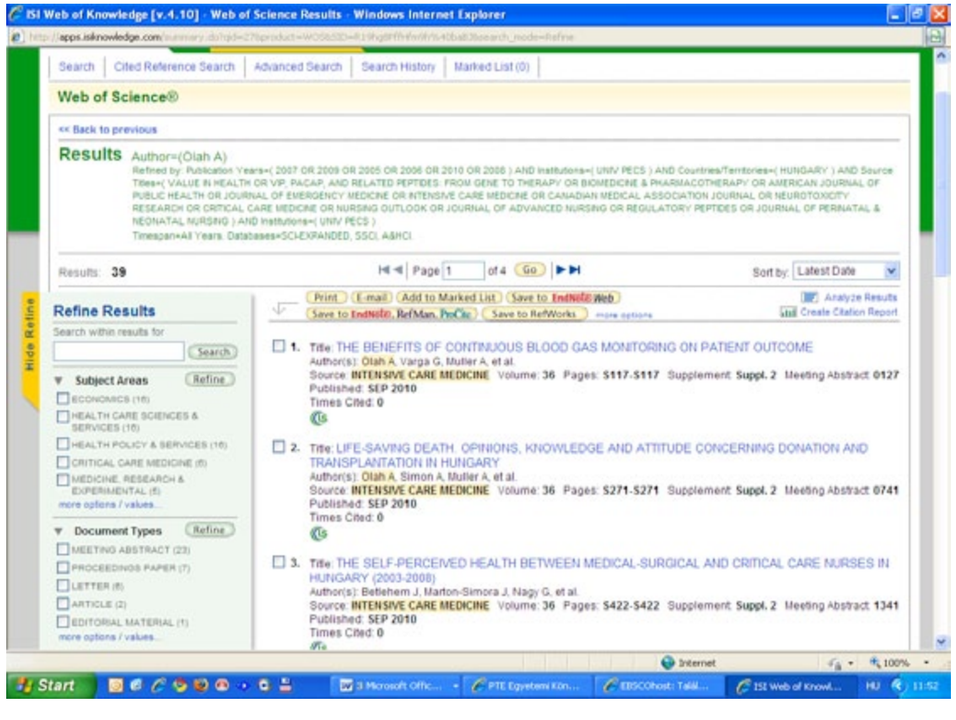


Figure 28: Connection to Web of Science database through EISZ database

Advanced Search

In this case, search terms can be linked by u ing Boolean operators. The other settings are the same as at simple search mentioned above. Enter the search query in the following manner: at topic search enter a search query in the search box and click the Search button. Example: stroke and nutrition, in English, in the time period 2007–2008 *(see Figure 30):*

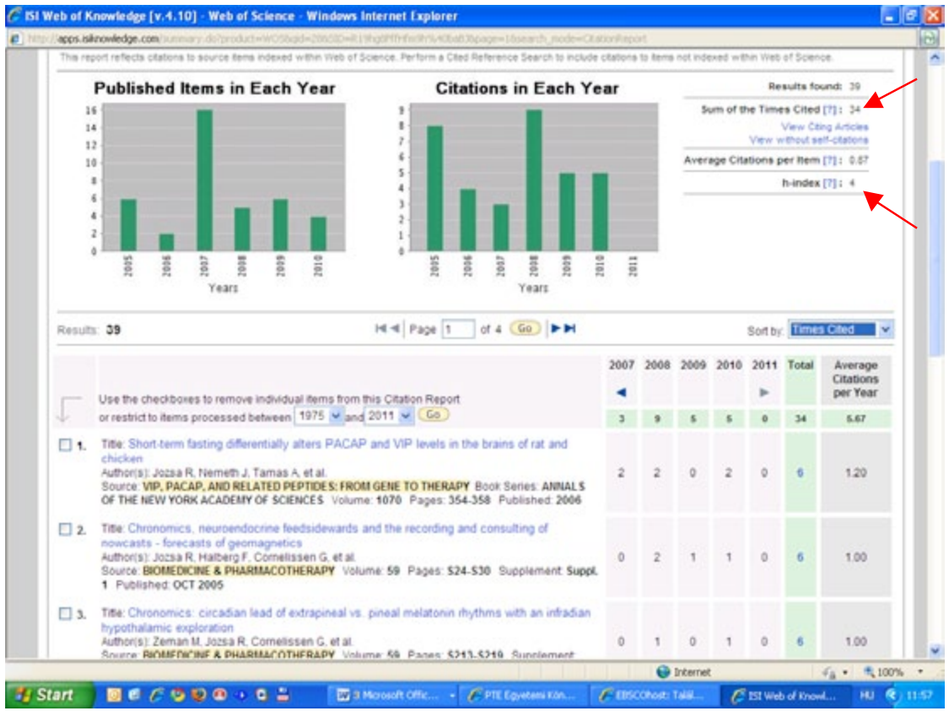


Figure 29: The number of citations and h-index in WoS

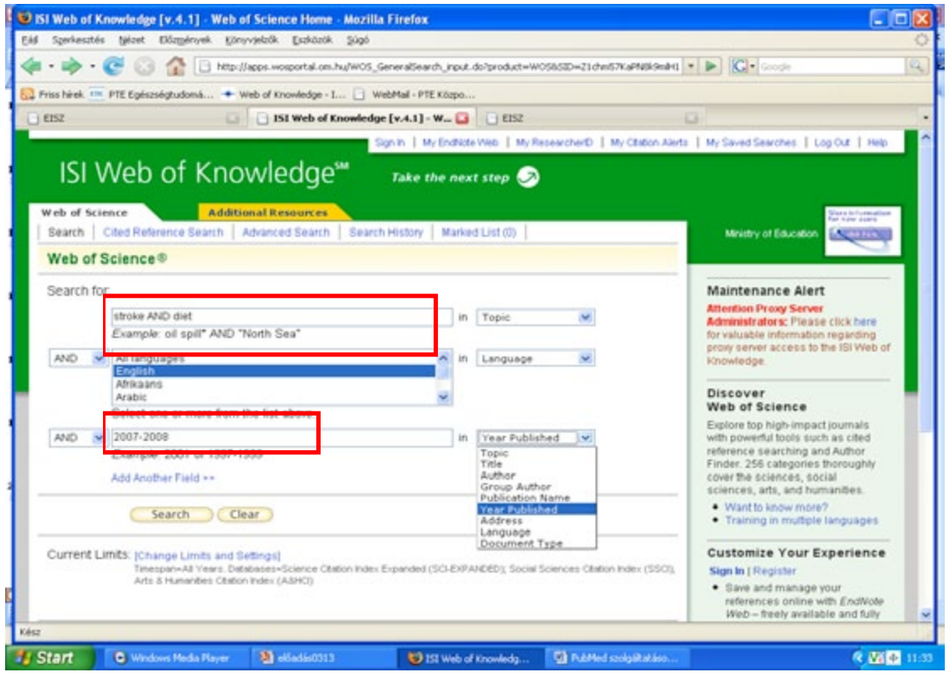


Figure 30: Search options in the Web of Science database

Figure 31 shows display of the hit list. The set of hits is 100 records - 100 results in the case of relationship of quick search of the Stroke and nutrition topic in English in 2007-2008. The following illustration shows the top five hits. The detailed display can be started by the check box before the serial number of the record. The fourth and fifth hits are available with full text.

After the fourth record is selected, the following is displayed *(see Figure 32)* the title, author (s), journal title, year number, volume number, page number. You can see the number of references (Times Cited: 0, in this case there is not any), and literature used in the article, number of references (References: 28), by clicking on it, the bibliography of the article can be seen. A full display will be visible by

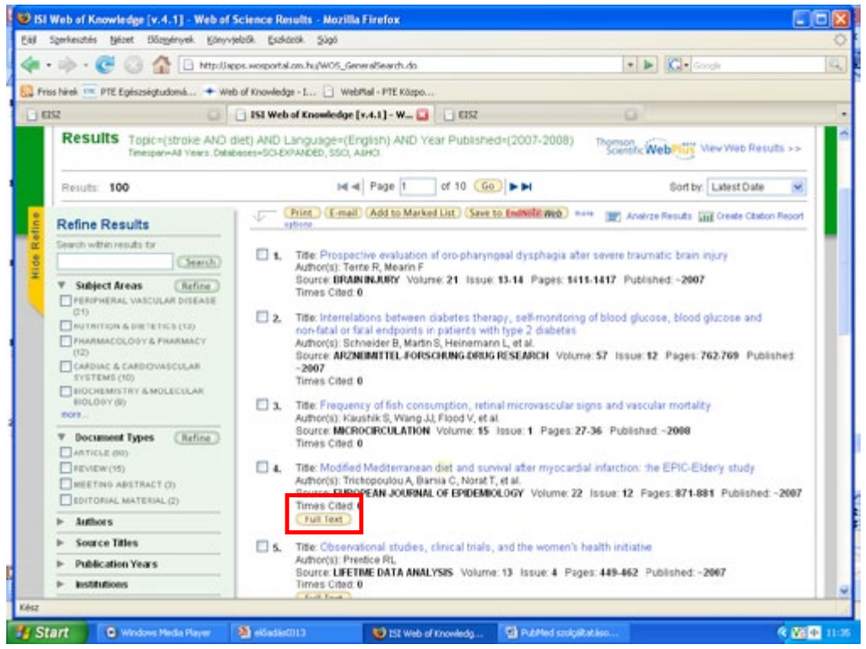


Figure 31
shows the display
of results
of the database Web
of Science

Figure 32:
The detailed display
of the selected
hit/result

clicking on the Full Text icon. The data items of the marked articles can be printed, sent in e-mail, can be added to the list of marked items (Marked List).

ScienceDirect

Science Direct is the full text database service of the scientific publishing house Elsevier. Its main profile is the dissemination of scientific, technical and medical journals in print and electronic form. It provides full text access to the electronic version of its self-published paper based journals and to journals of other publishers. It allows you to search bibliographic data, and access full-text and database jointly. There are magazines that can be found in the database before being printed. The search can be simple, complex or browsing (Browse). At simple searches the article title, keywords, abstracts (abstracts), author, the title of the journal or the book, the related parameters of publication can be searched. Figure 33 shows the initial interface of Science Direct. On the left hand side of the front page the option of browsing (Browse) can be seen. You can select an initial letter or topic / subtopic and display the list of all books and journals available via Science Direct. This includes both pre-paid/subscribed and non-subscribed journals.

By quick search even from the front page you can search for the most common criteria: title, extract / abstract word, keywords (title, abstract, keywords), author (Author), Document Title (Journal / Book Title). If you fill in only this, you will get the magazine list, if you also fill other fields, you will get a list of articles as a result. In particular, even the exact year (volume), number (Issue), start / end page (Page) can be given. To start search, click on the button "Go". If more than one field is completed, AND contact prevails between them. You can also use operators (AND, OR, NOT, quotation marks ("the words in quotation marks are searched as an exact phrase") and truncation (*- any number of characters) *(See Figure 33)*.

There are currently more than 1,900 journals available in full text, these contents are indicated by a green coloured page. It is important to note that the full text of these journals can be viewed only from 1995. Figure 34 shows the narrowing option of browsing, the magazines and books are in alphabetical order in the database. The list can be narrowed according to several aspects. You can choose to search only the subscribed or not subscribed documents. Or search only the Journals and Book Series (Periodicals + book series), and / or Books (books) - Reference Works (reference work) (A). By clicking on the appropriate initial, you can jump to the titles starting with it(B).You can have a look

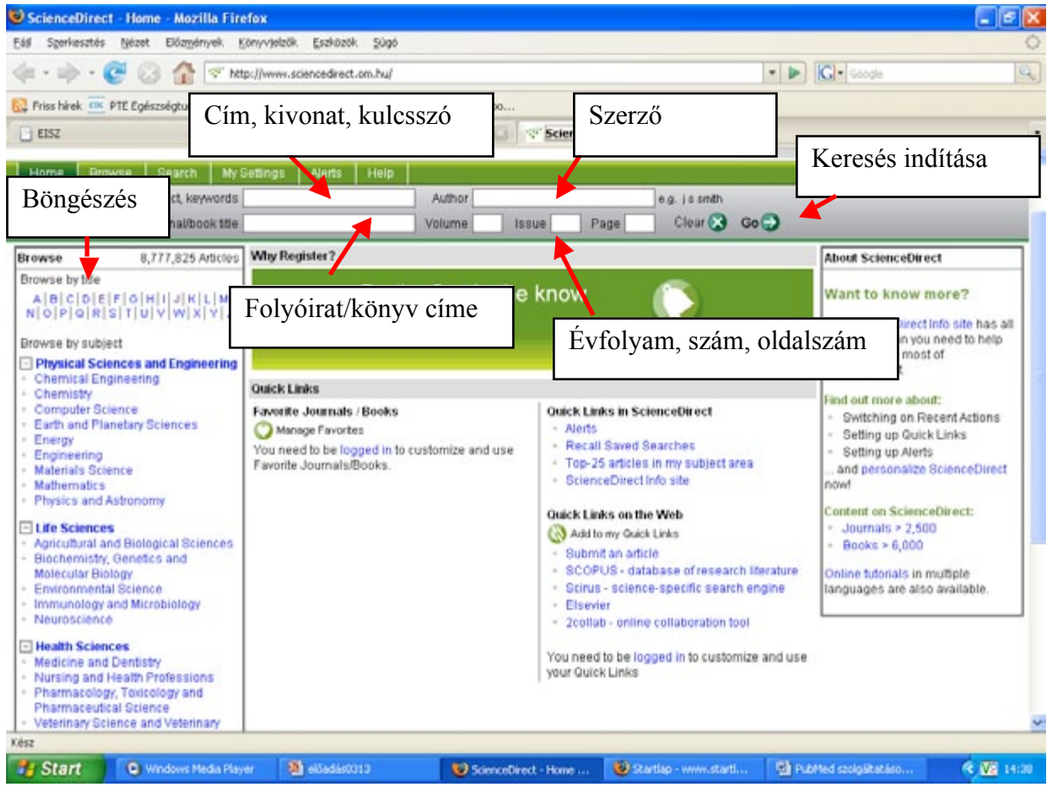


Figure 33: The search interface of Science Direct database

at the articles not yet published but being in final form, by clicking on the Articles in Press (latest articles) (C). Click on the title of a journal and you can go immediately to the table of contents.

Figure 35 shows that if we know the names of the authors (such as Jozsef Bethlehem and Andras Olah) and want to see their articles which can be found in the database, we should type the name of both authors in the search field, and use

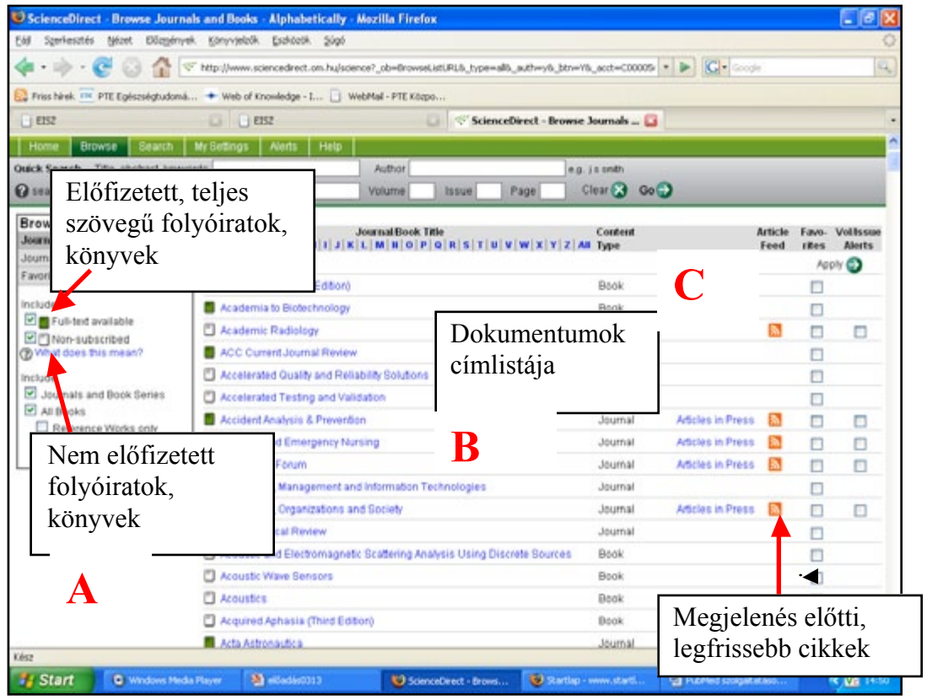


Figure 34: Science Direct database

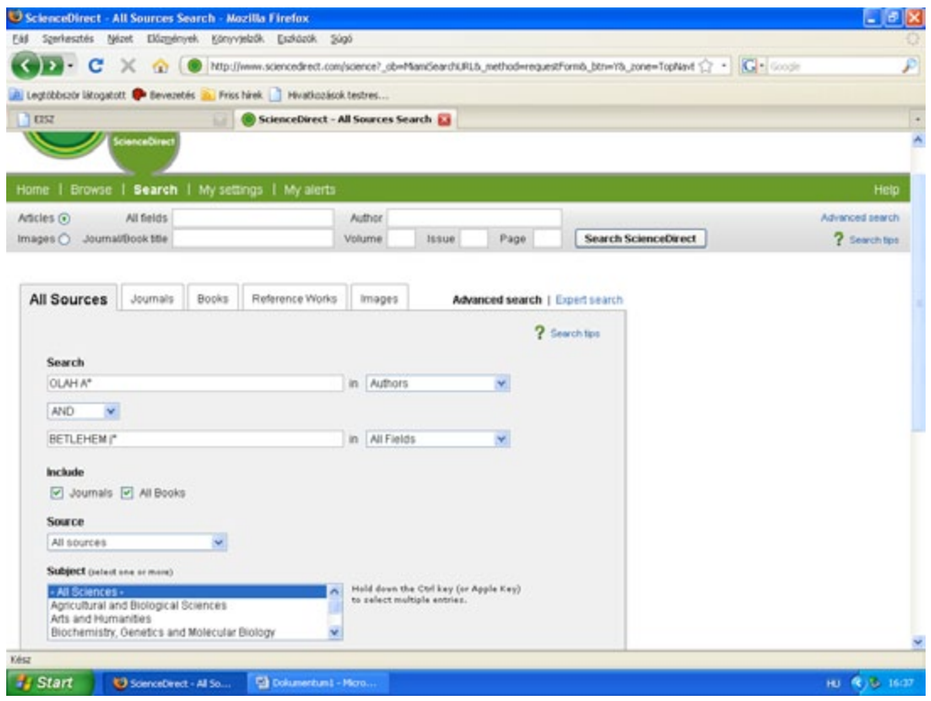


Figure 35: Author Search Chart in the Science Direct database

the AND operator. Combining multiple fields of the default AND (AND) logical connection is used by the database. The number of hits is 14. At this search no narrowing has been set besides the type of the document (search for book and journal). Narrowing can be set to the field of science, the year of publication, the exact volume, issue, page number.

The result list includes the articles corresponding to the search criteria (see Figure 36). The list includes by default only the article title, the author(s) and the exact date of publication. A detailed display can be started by the check box after the serial number of the record. The articles which are preceded by white squares are not subscribed, so just the abstract can be read. The short extracts related to the individual articles (Show preview), full-text versions (PDF) can be available directly from the list.

The article we search for is selected from the results list (see Figure 37). Its display includes detailed information on the authors' workplace, e-mail addresses, as well as a brief abstract (extract) and the links/references can be read. If the article was cited, it can be seen (A), and right after the article citing it can be viewed along with its authorship data and its abstract (extract) (B).

SpringerLink

The knowledge of the Spinger Link database is important from the point of view of literature research which currently contains 2,439 different periodicals. Due to its multidisciplinary character it processes the professional literature of other disciplines in addition to medical science (e.g. psychology, physics, chemistry, mathematics and statistics, biology, etc.). It is available at http://www.spingerlink.com. The structure, the function and the search method of the database is similar to the ones dealt with so far. The table of contents and abstracts are available free of charge, but only the subscribers of the printed version or the visitors of libraries of higher education institutions have access to full text articles (within the frames of the EISZ).

Scopus database

It is one of the largest abstract and citation database searches. It is updated daily. It is a multidisciplinary bibliographic database. The citations are searchable back to 1996. It is available at http://www.scopus.com.

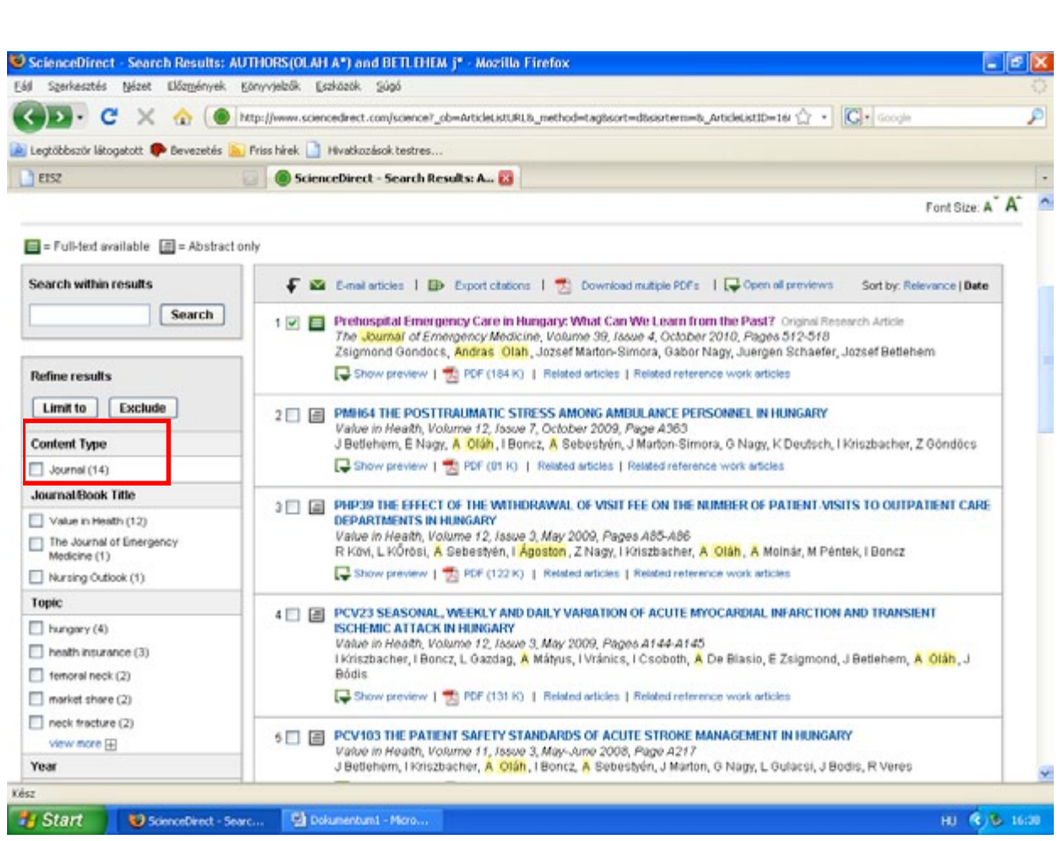


Figure 36: The display of bibliographic records in the Science Direct database

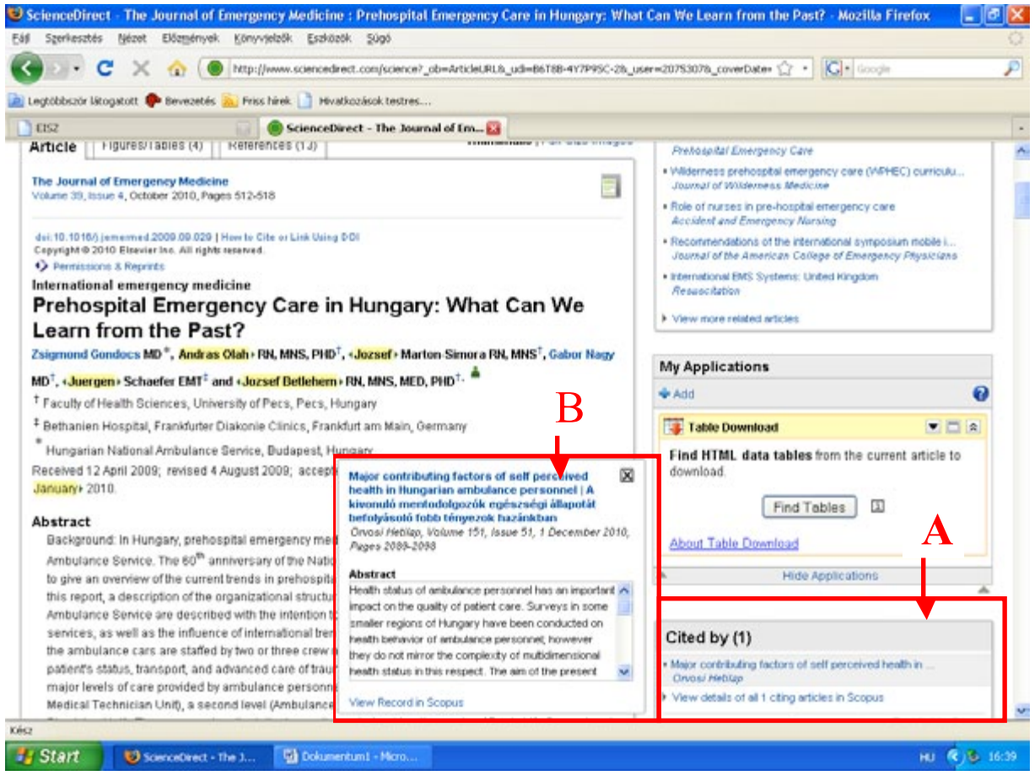


Figure 37 shows the selected result

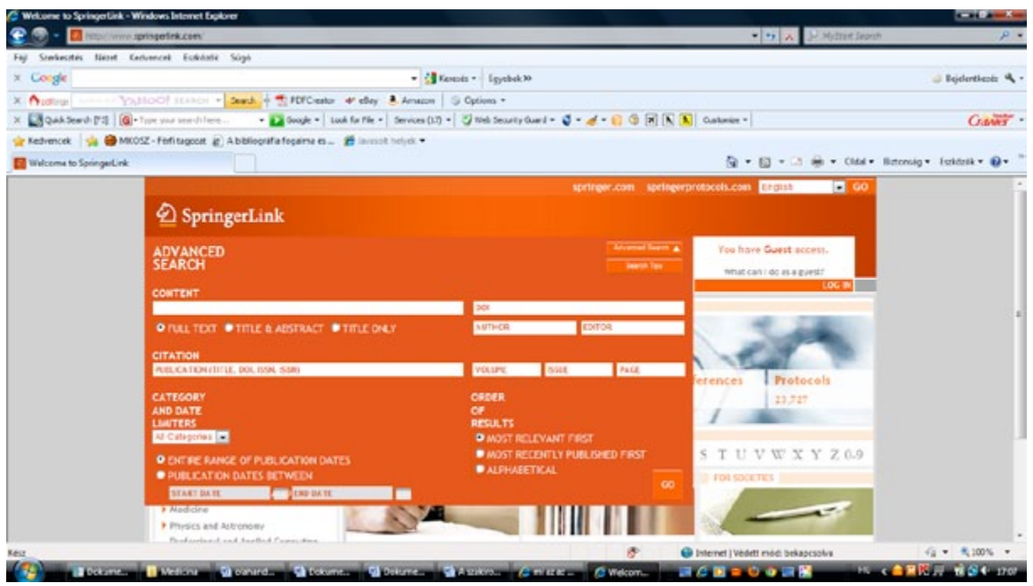


Figure 38: The database of SpringerLink

After entering you can see the options at the top of the page – Search Documentation (document), Search Author (author), Affiliation Search (institutions) and Advanced Search (advanced search) (see Figure 39). If you know the author's exact name, selecting the "Author Search" is the most appropriate. In the Finder window the last name (without accents) and the first letter of the first name is to be written, then the search can be started by the Search button.

The search results will appear in tabular form, so the results can be ordered easily by the following criteria (Refine results): Source Title (journal title), Affiliation (institution name), City (town name), Country (country name) Subject Area (subject word) *(see Figure 40)*. Figure 41 shows that the name of the country was selected, so we got much fewer hits than in the first round. There are 17 search results at present. Therefore, one can choose exactly which one to look for. In this case, we

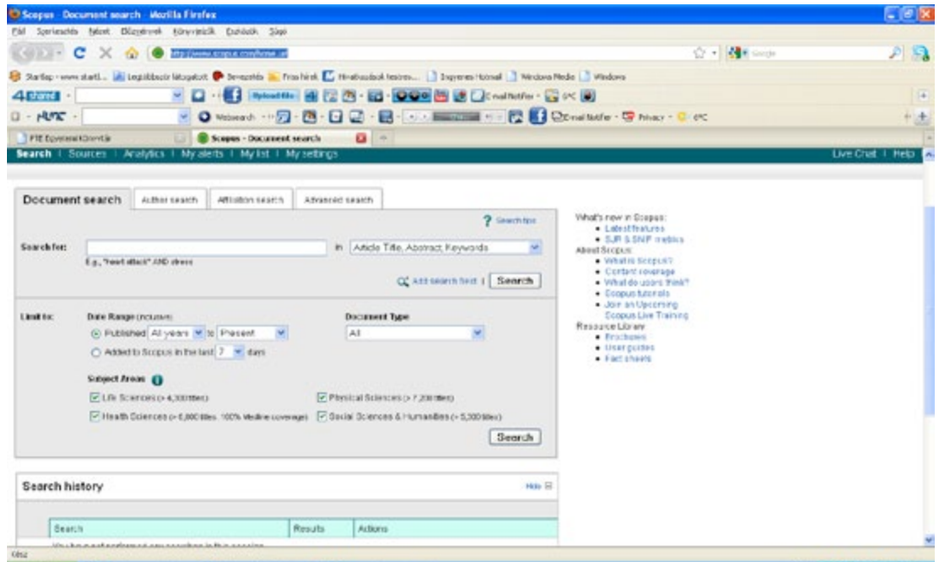


Figure 39 Scopus database search interface

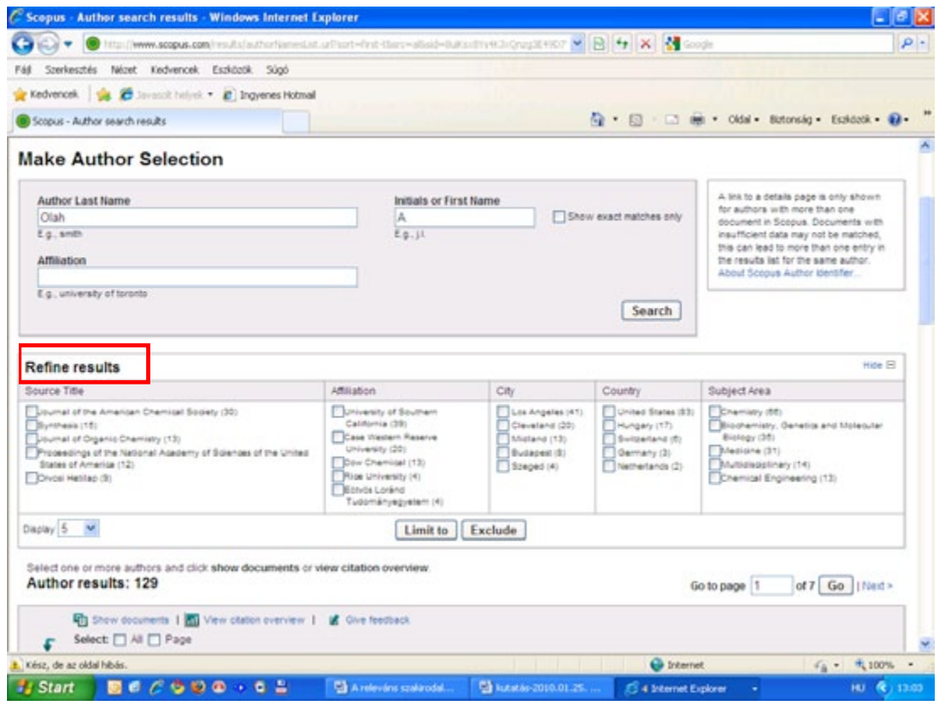
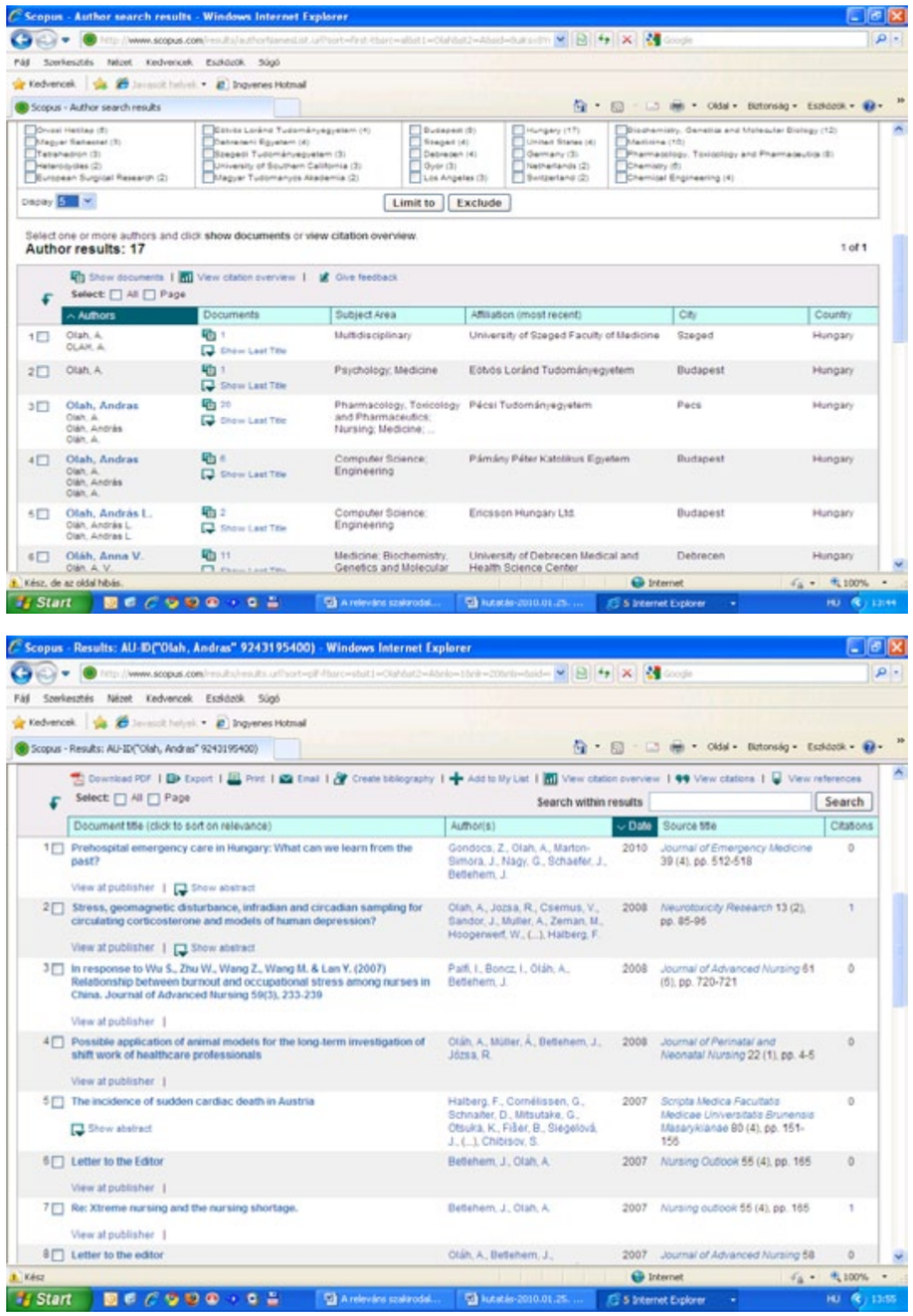


Figure 40: Searching for author and narrowing options

are searching for the publications of Andras Olah, a lecturer of the University of Pecs. Figure 42 shows that the author has 20 documents in the database. The search resulted in a list of grouped data in which the items relevant to us can be marked, the data of the marked publications can be displayed by clicking on the "Show documents" button. We can choose on demand from among the items in the list by individually marking the little windows, the content of a specific page, or by marking all the results together (Select: All or Page).

The Scopus database indicates the references, together with the corresponding links, to the article in the records within the database. Results can be put in ascending or descending order, but you can specify them according to document title, author, title of journal, respectively the number of citations *(see Figure 43)*.



6-41. ábra.
A szerző kiválasztása a listából

Figure 42:
The list of an author's works which can be found in the database

Figure 43 shows that the Scopus database prepares a summary of the author where you can find the number of documents (currently 20 units) which can be found in the database, specifying the number of literature used in the documents, in this case 462 pieces. There are 51 references to the articles and it also shows the h-index number, 6. Figure 44 shows the h-index calculation. The details of the h-index can be found in the section of Hirsch-index.

We see that we can get different h-index and different reference numbers in the database of Web of Science and Scopus. This is possible because each database can provide the result only according to its own database, that is, h-index is different for each database.

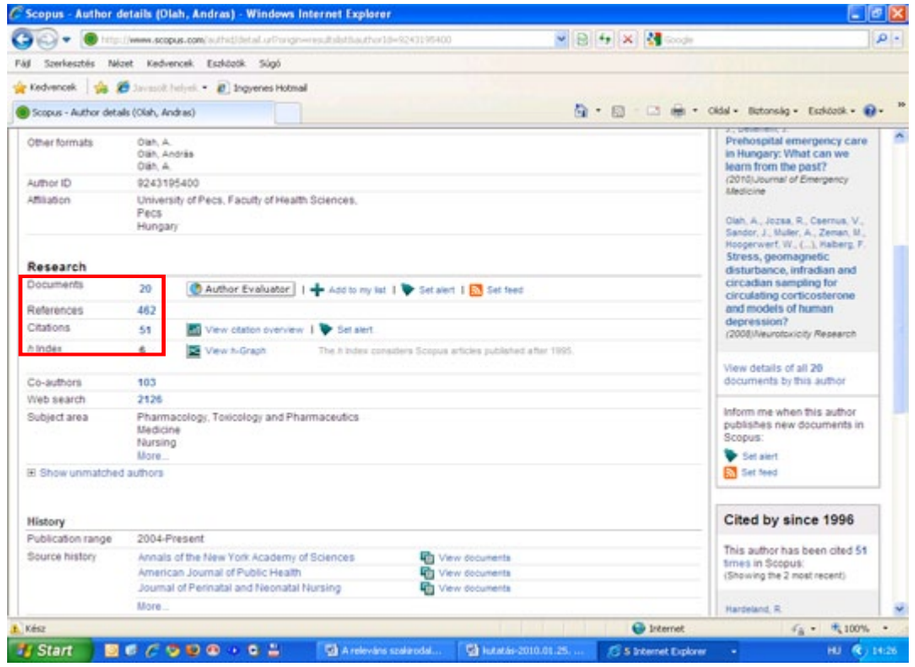


Figure 43:
The summary of an author's works

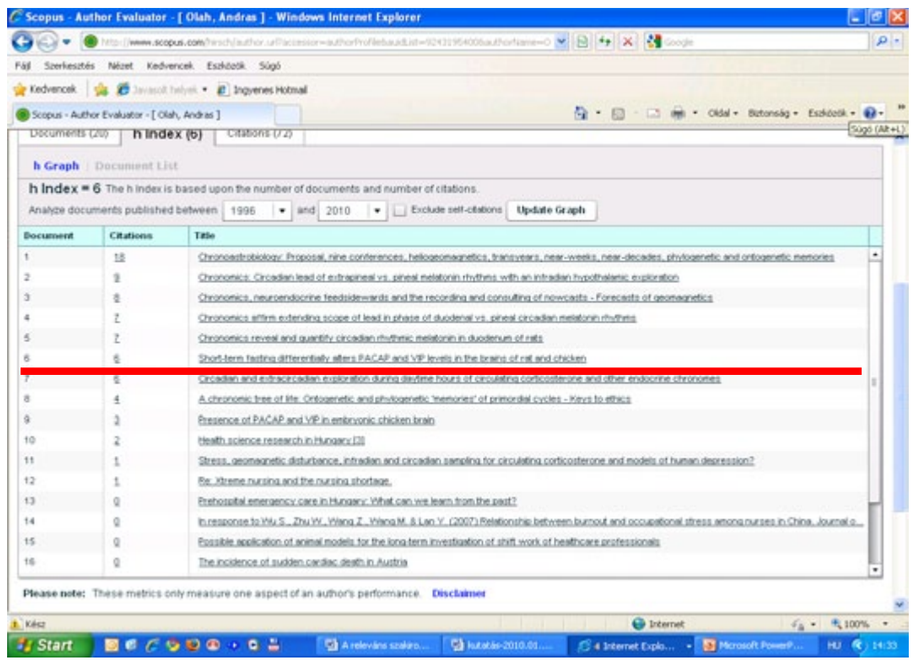


Figure 44:
The calculation of h-index using Scopus database

OVID

OVID is an international database -distributor which created a common interface for the search of databases sold by it. Initially, OVID released Medline on CD-ROM. Via OVID only the journals of the publisher Wolters Kluwer and Lippincott Williams & Wilkins (LWW) can be accessed in addition to Medline and Biological Abstracts (BIOSIS). It is available at the site http://www.lib.pte.hu/adatbazisok. You can also reach it at home, so by entering the necessary code (EHA code and password), the database can be used outside the University of Pecs *(See Figure 45)*.

Multiple databases, books and journals can be searched. The OVID Medline database is selected here.

- Search mode *(see Figure 46)*:
- Basic Search – some relevant results
- Find Citation – Search for a specific release, when we know some of its bibliographic data
- Search Tools – disclosure of subject headings
- Search Fields – search according to various aspects, fields, for example: institution, country, etc.
- Advanced Ovid Search – traditional, advanced search,
- full disclosure, key word - subject heading search
- Multi-Field Search – faster search option by combining multi-field opportunities.

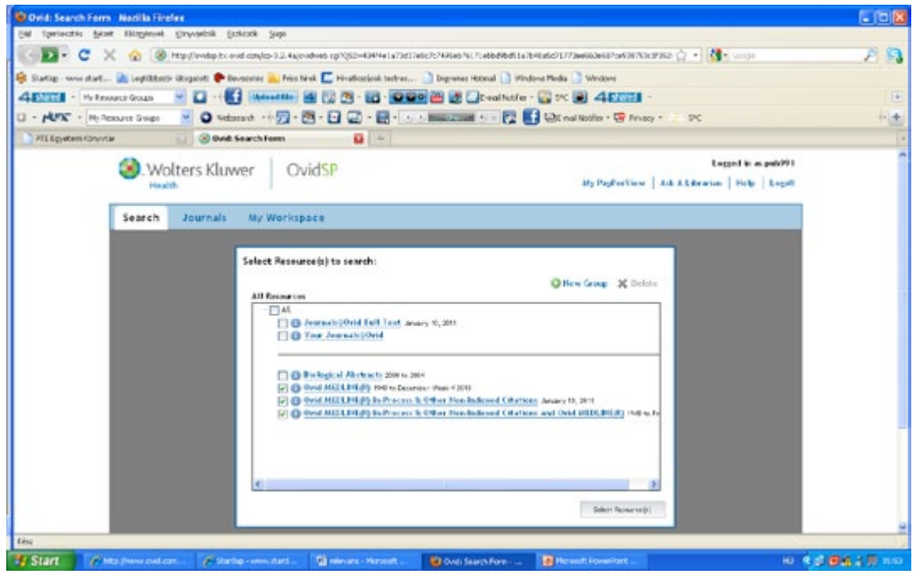


Figure 45: OVID database search interface

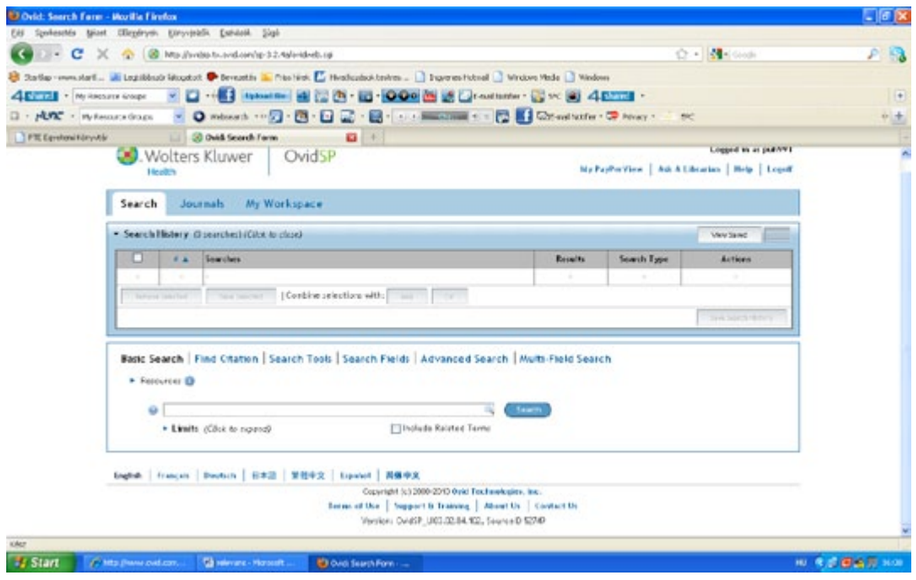


Figure 46: The different search methods of OVID database

At basic search (Basic Search) (see Figure 47) you enter the question in the search box, you can narrow the search result sets. In the search box, you have written the "burnout" search term and the search is narrowed, because we can see that we got too many hits (3,712 units). It is narrowed to the year of publication, because we wanted to know how many documents were published on this subject between 2010–2011, in English, full text (Full text). You can see that the number of hits dropped since in the year we search the number of hits is 104.

In Search History you can display, delete, and save your findings and you can even set automatic search alerts, applications of RSS news channels so that you can get the latest information.

Figure 48 shows that if you turn on the Include Related Terms, the search term related terms are searched for.

Figure 49 shows the number of search results for search. Short information is given about the items. The article title, author(s) names, journal title, the data of publication (publication year, volume, issue number, page number). The author(s)' full name and a short abstract (extract) can be read. The article can be downloaded and displayed in format (PDF), if the database service allows it.

Complete Reference (see Figure 48) provides more detailed information about the given record, the authors' address, where they do research, the detailed title of the magazine, but the most important of these is that it describes the

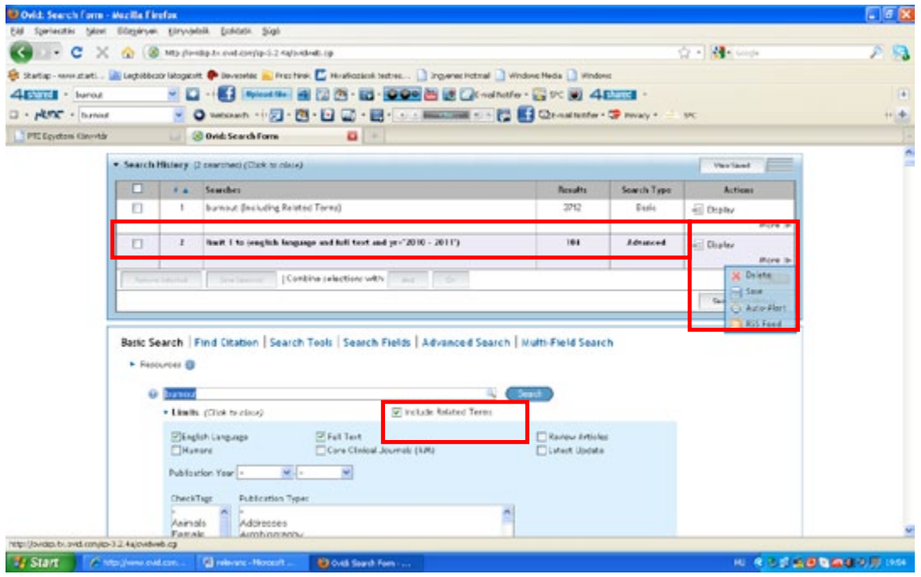


Figure 47: Basic Search and narrowing in the database

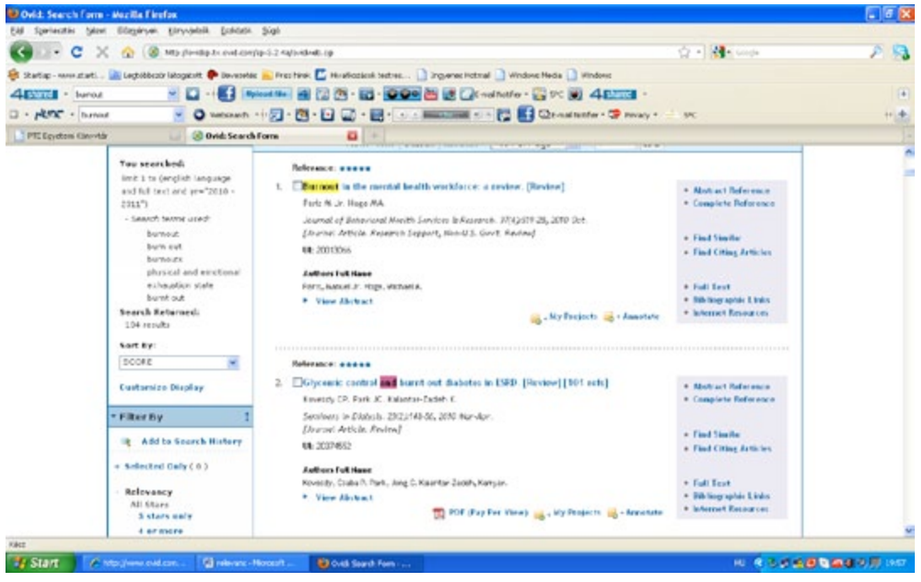


Figure 48: The display of bibliographic results

Mesh object words in detail. It enlists in detail what subject headings the article got when it was added to the database (See Figure 49). The references in the article can be viewed here if you click on the Bibliographic Link.

Results can be printed, saved or exported in a Word document or in a PDF file.

MATARKA

In our country the service of the longest table of contents is MATARKA (Searchable Database of the Table of Contents of Hungarian Journals) that is freely available via the Internet as a library enterprise. The service covers the table of contents of the journals edited in Hungary, more than 1,000 journals are processed. Since 2002, with the leadership of the University, Library, Archives, Museum of Miskolc it has been being set up and the University Library of PTE has also been involved. The content of the database includes the database of the tables of contents of mainly Hungarian speaking professional journals published in Hungary or in the Hungarian speaking areas of the surrounding countries. The tables of contents show the tables of contents of issues of journals published in print, including the authors, titles, headings and page numbers, and links to the full text of articles, if they can also be found on the Internet. Besides browsing the table of contents of some of the issues, it is possible to search for the author's name and title words. Searches can be narrowed down to search time, discipline, journals and articles with full text index, furthermore to full text articles provided by the National Széchenyi Library's (OSZK) Electronic Periodicals Archive (EPA).

The availability of database: http://www.matarka.hu.

Similar to the search described previously, in this instance you can choose between a simple, advanced (complex) search or browsing. It is logical and easy to use. There are two searches within the simple search at our disposal.

1 Quick search. Up to five words can be entered into the search box, the search is based on the AND connection between the words, so there is a result only if each specified word is found. The obtained set of results can be narrowed later on. We search for the authors' name and titles of the article, but the given full expression must be searched in both places. If you want to search only for the articles of some specified author(s), consider using another method of a simple search which is mentioned below.
2 Search. Four input fields can be used. In each entry field you can specify one or more words that are automatically in AND connected with each other. In addition, the four input boxes are also in AND connected with each other that is the section of the generated result sets gives the final result set. Not all input fields are to be filled (see Figure 50).

Options of narrowing

- *Time:* Results are displayed from the selected date.
- *Speciality:* only the titles of the journals assigned to the special field are included in the search result sets.

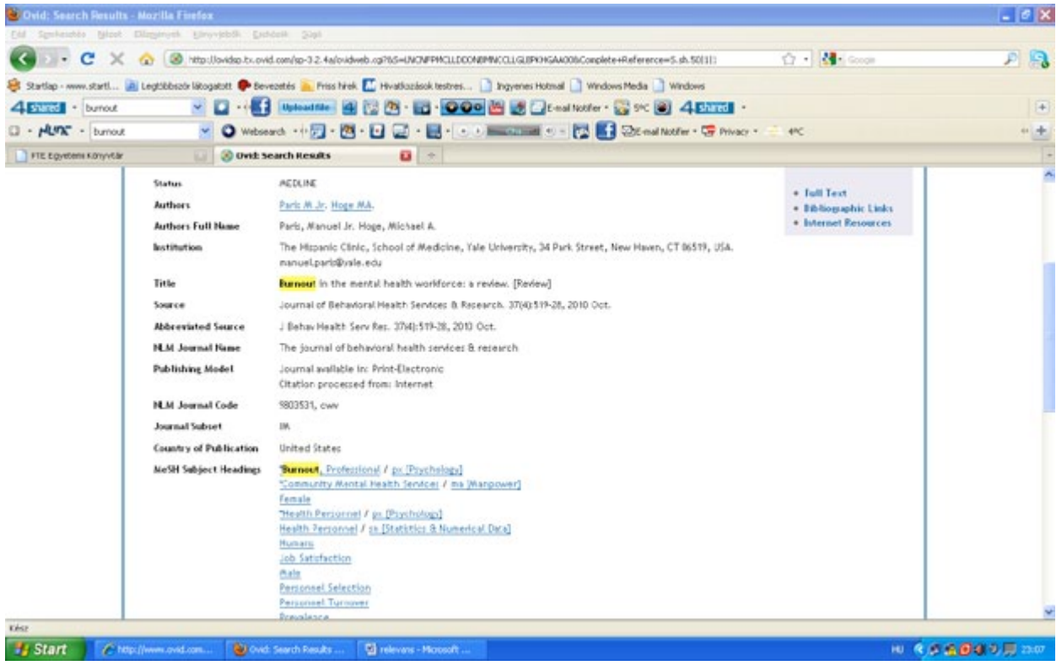


Figure 49: Detailed display of the record

- *Journal:* only the journal titles selected are included in the search results.
- Only articles available with full text: only the results with links showing full text index are displayed. Links indicating full text point to about 5% of articles.
- *Only the articles archived in the EPA are displayed:* Only the results of full text articles with jump points of the journals archived in the service of the Electronic Periodicals Archive of the National Széchenyi Library are displayed. Particular narrowing options can be used together accordingly. Of course, the combined selection of a technical journal and the special field of social sciences may not result in too many results.

The results are displayed in chronological order by the database (see Figure 51), the foremost is the latest, and which you are interested in must be marked in the check box and you must click on the correct item.

The title of the journals processed can be selected on the basis of a list either in alphabetical order (see Figure 52), or a list of the special field. The selection of the title is followed by the selection of the appropriate volume and issue (see Figure 53). The description of the article found in the given issue contains the internet access to the given study or journals online.

The data of the journal we are looking for can be found

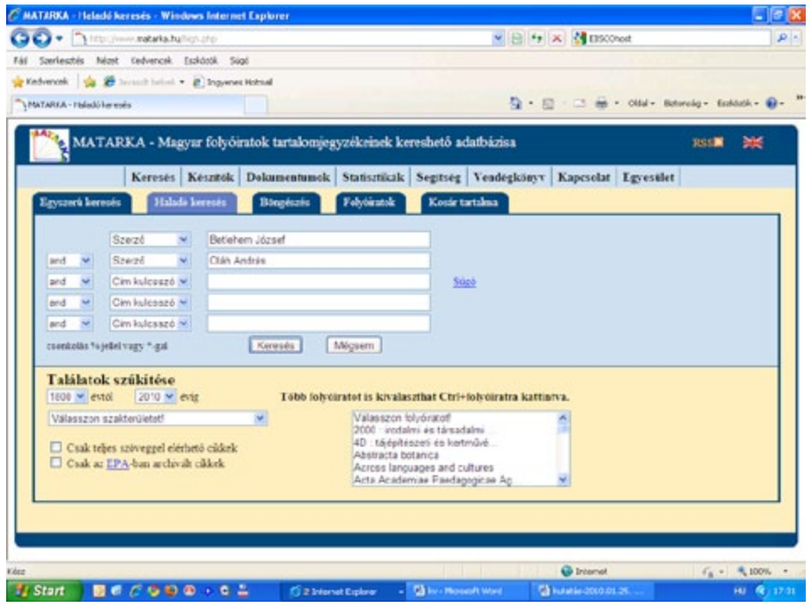


Figure 50: Simple search with two authors

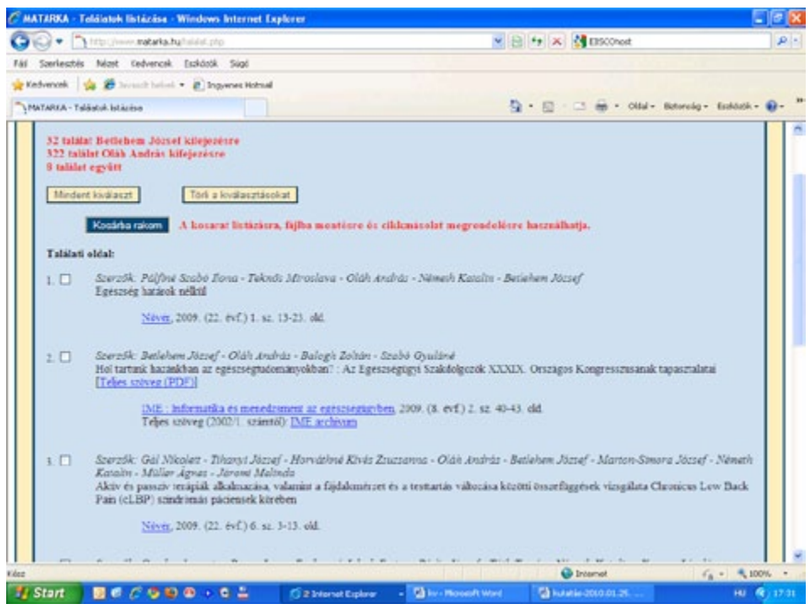


Figure 51: The display of the result page

in the database (see Figure 54): the exact journal title, publisher's name, since when it has been published – if its publication ceased, and when – the specialty category, which website the journal was published on and its language. A simple bibliographic list can be created through the website, which can be saved and printed. After the search is completed, the results must be saved in the cart, the list format completed, and the results file saved. This way, saved data can be used for listing and ordering a copy of the article.

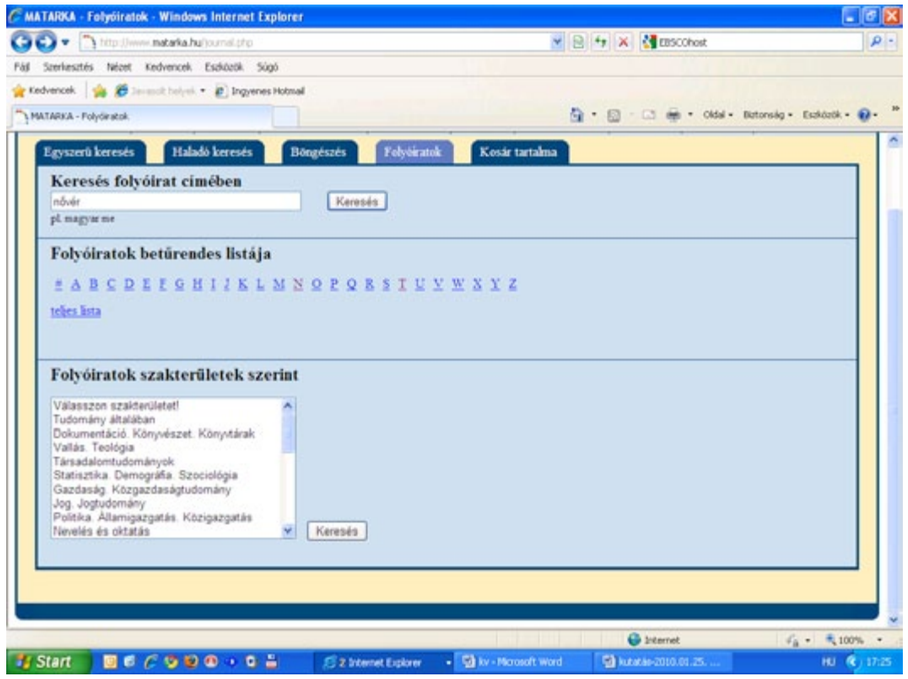


Figure 52: Search in the title of the journal

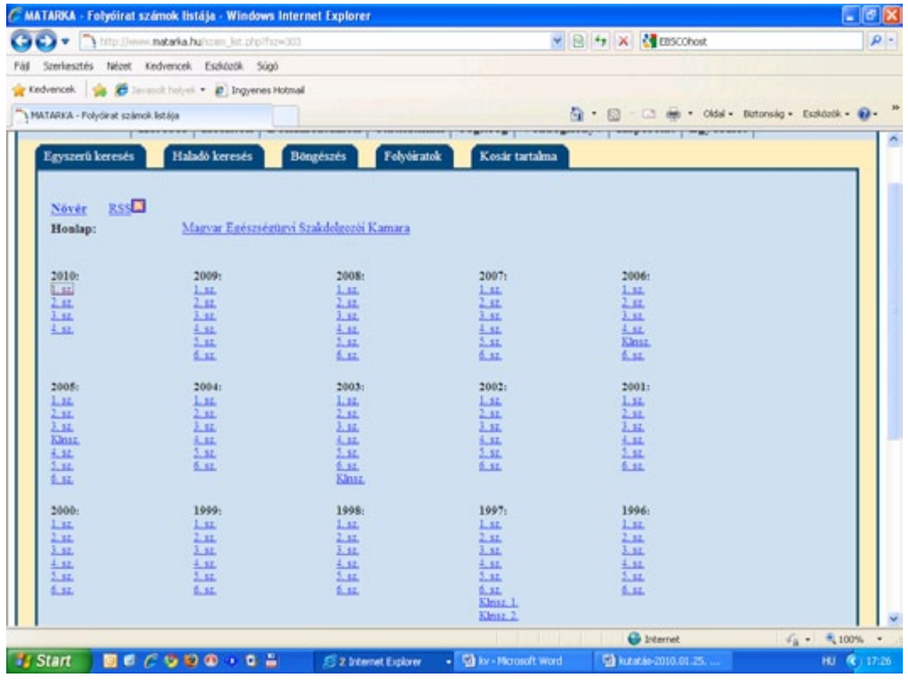


Figure 53: Presentation of the issues of the journal we search for

Request Article Copy

The articles that are not available in full text can be ordered and must be paid for.

The advantage is that not only do we get information about the table of contents, but we can switch directly to the full text. The disadvantage is that the advanced search in detail is not allowed, because it does not contain any subject words. The thematic search is provided on the basis of the search words in the title. Processing time for each journal is different.

E-journals

"E-journals are an indispensable component of special scientific information systems and their importance, scientific and informational role has been growing because of the introduction of computer culture." Electronic publishing and online access with full-text has been playing a growing role in the field of information service.

The features of electronic journals

- it gets to the reader more quickly than the printed version
- access is possible regardless of place and time
- at the same time the same issue can be used by different people
- the information found is downloadable, printable and can be converted (PDF, HTML)
- editing is the same as that of printed journals, they are the same from a bibliographic point of view

Types of electronic journals

- available free of charge
- registration required, but free of charge
- registration with a subscription is required
- subscribed access to a particular journal
- subscribed access to more journals

Some electronic journals

- disclose only contents
- contain extracts (abstract) of the articles
- contain full-text publications (full-text)

National medical and health science journals available on the Internet

The list of e-journals which are available from the library of the *University of Pecs (see Figure 55)* is at http://www.lib.pte.hu, click on electronic journals. Directly at http://aok.pte.hu/library/index.php?page=folyoiratok. The on-line electronic versions of journals are only available from the IP range of the University of Pecs (http://www.lib.pte.hu). The journals are in alphabetical order. You enter the journal title in the search box.

We are searching for the journal 'Sister'. The results are displayed *(see Figure 56)* and the exact journal title, publisher, online availability, as well as other observations, such as, from where to where the full text access is available, can be seen.

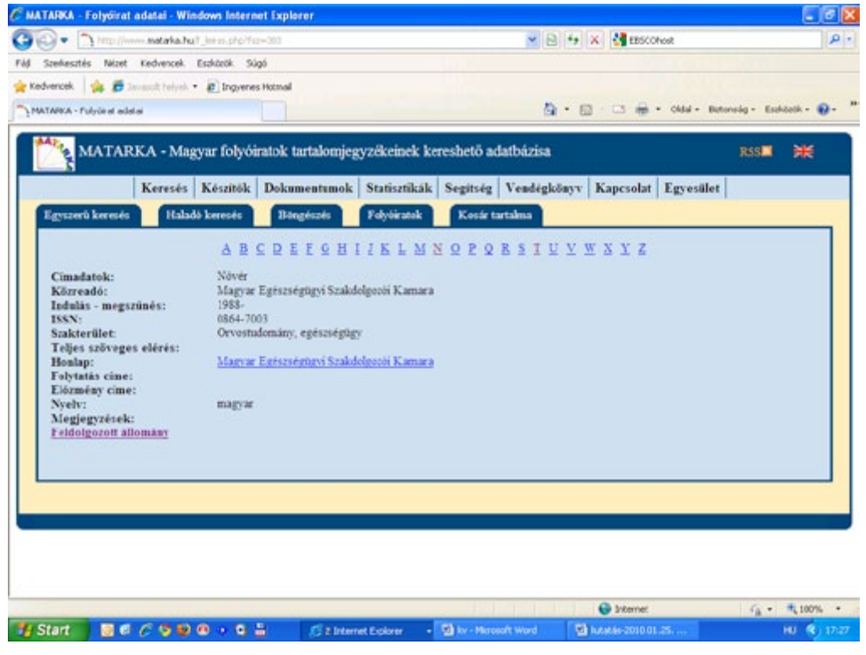


Figure 54: The display of the data of the journal we search for

Clicking on the URL link, we get to the journal. See the electronic journal browser *(Figure 57)* of the University Library of *Debrecen University and Kenézy Life Sciences Library of the National Library (DEENK)*. The number of full text journals available electronically from the University of Debrecen is approximately 6,000 biomedical journals. Not only journals, but also topics may be searched for. Electronic address: http://kenezy.lib.unideb.hu/hu/elektronikus_folyoiratok .

It is possible that the journals can be available by not only using the computers of the University but using computers at home.

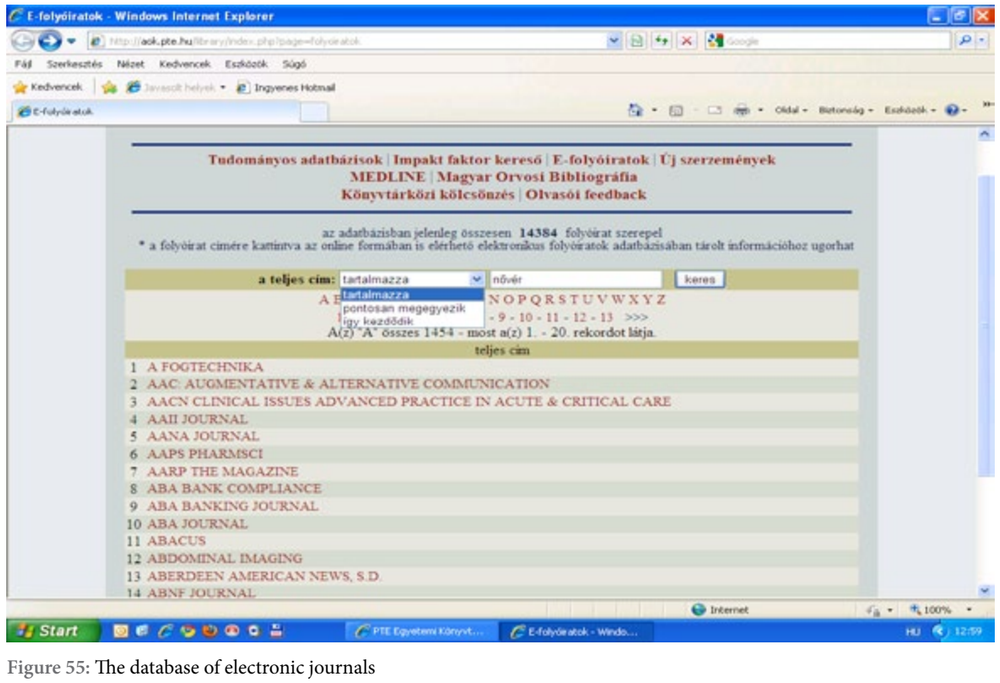


Figure 55: The database of electronic journals

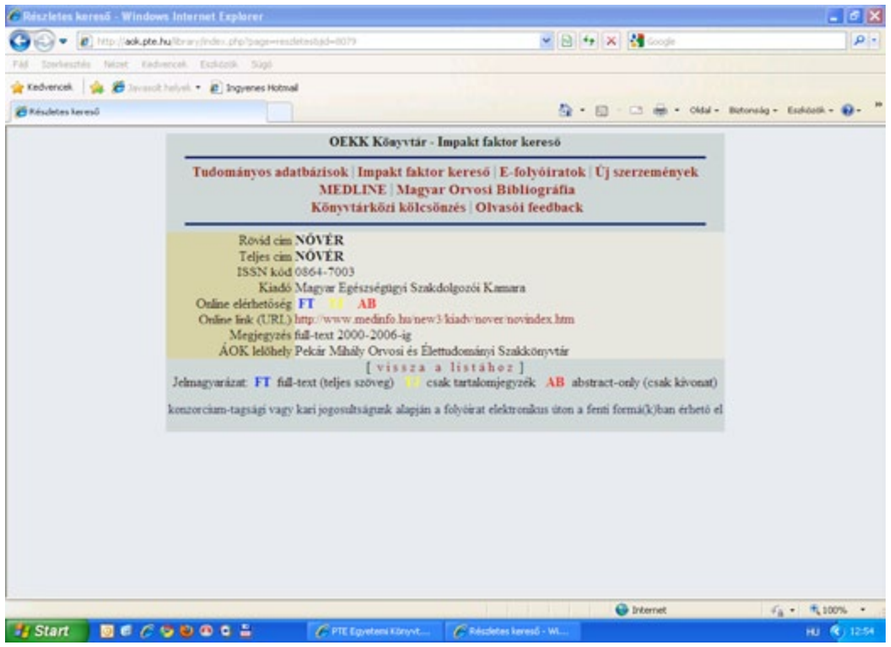


Figure 56: Searching for the journal 'Sister' in the electronic journal database

University Library of Szeged University

The electronic journals, databases and the website of the freely usable internet resources can be found in alphabetical order via the computer network of the University Library of SZTE. The e-journals are divided according to fields of science, making the work of students and researchers easier. The distribution according to the fields of science can be used by the help of a quick link which can be found on the website *(see Figure 58)*.

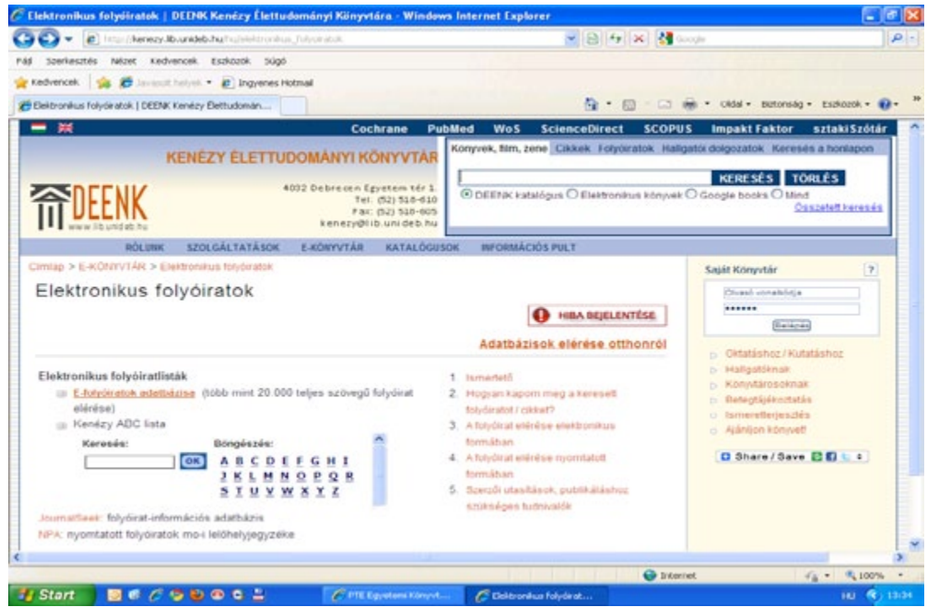


Figure 57: The electronic journal collection of Kenézy Life Sciences Library, University of Debrecen

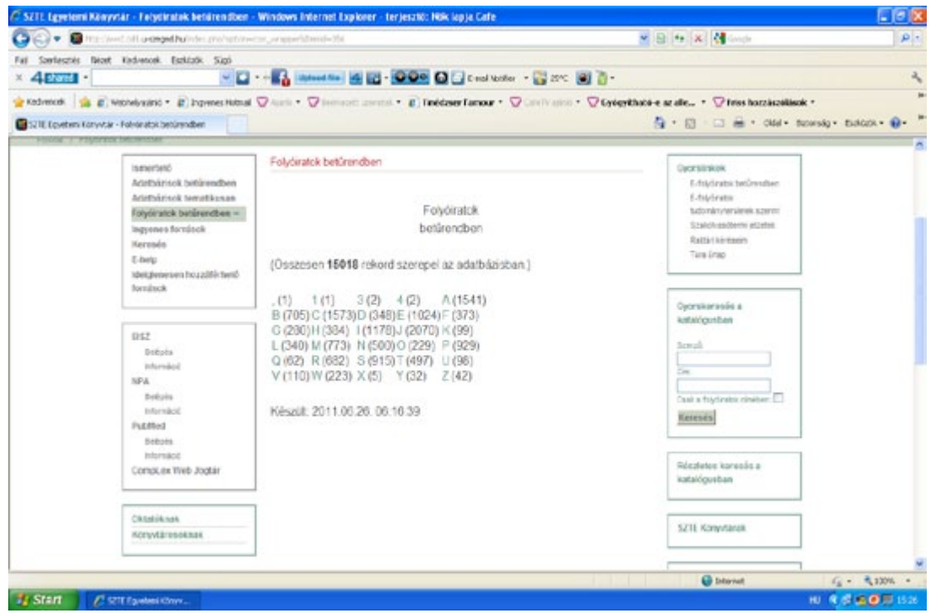


Figure 58: The collection of journals of the University Library of the University of Szeged

Semmelweis University Central Library

The access to the electronic, on-line versions of the journals is only possible from the IP range of Semmelweis University (http://www.lib.sote.hu) *(see Figure 59)*.

Semmelweis University, Faculty of Health Sciences Library

The list of e-journals available from the Library of the Faculty of Health Sciences of Semmelweis University (http://www.se-etk.hu) includes the list of domestic and foreign professional journals in alphabetical order separately (See Figure 60).

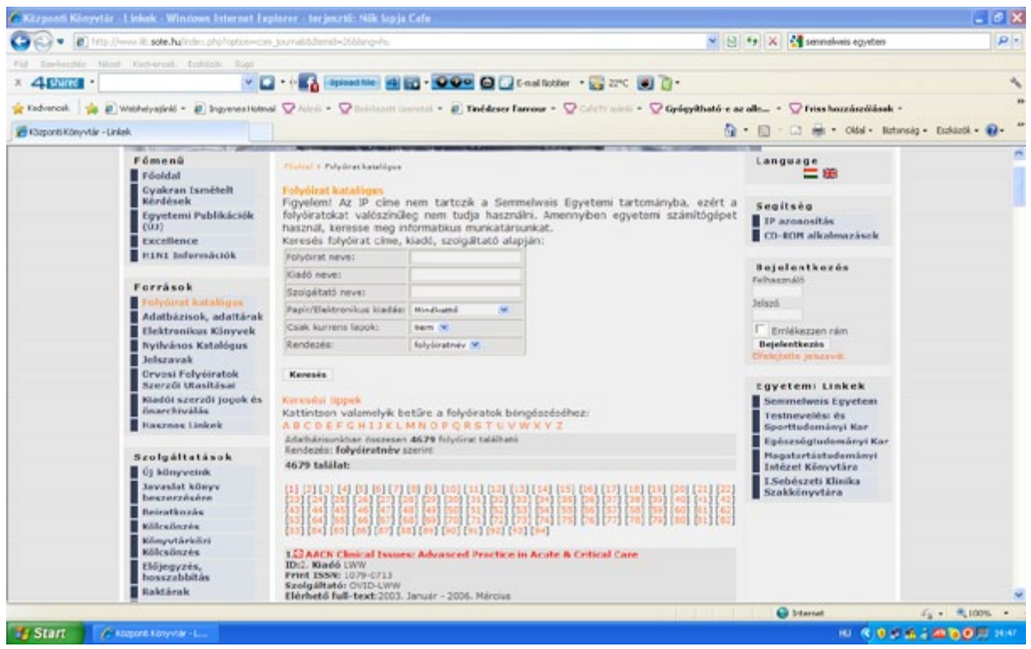


Figure 59: The collection of journals of the Central Library of the University Semmelweis

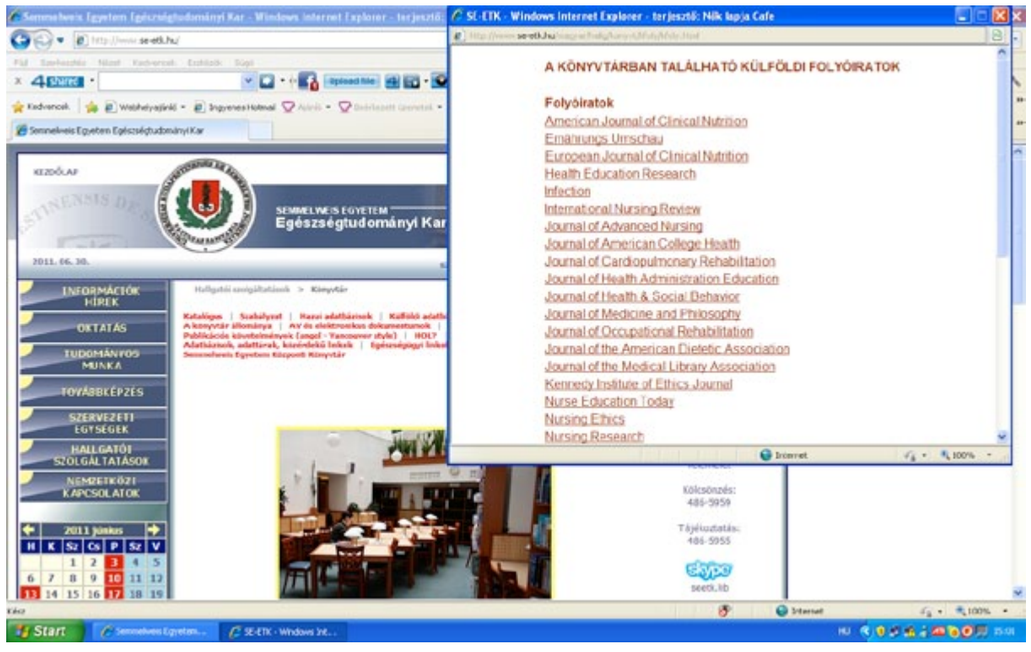


Figure 60: The collections of foreign journals of the University Library of the Faculty of Health Sciences of Semmelweis University

Open-Access Journals

The Open Access (open access) means that the scientific literature on the Internet is for free and publicly accessible, so those interested in the full text may read, copy, download and share them with one another, and also can search the text, refer to it and can use it in any other way without encountering financial, legal or technical barriers with those who they are in contact with through the Internet. The journals which are uploaded meet the quality requirements. You can browse the titles of publications, and according to fields of science. There is a multi-criteria search option and the results appear in full text. The peer-reviewed Open Access journals are included in the Directory of Open Access Journals (DOAJ). It is available at http://www.open-access.hu . It aims to enhance and to make the availability of Open Access scientific journals easier, and to gather in one place the availability of Open Access journals of various professional fields. The selected list of medical specialty journals can be found in the Annex IV.

Appendix I

Book:

Author name (year of publication): Full title. Place of publication: Publisher.

Dinya E. (2001): Biometrics in the medical practice. Budapest: Medicina Publishing.

For books with more than three authors:

First author's name and et al. (Year) Book title. Place of publication: Publisher.

Bodo M. and others (2005): The History of Hungarian Pathology. Budapest: Medicina Publishing.

Book chapter

Author name (year of edition): A book chapter, study or chapter headings. In: Editor (s) name (or ed, ed(s).) Book title. Place of publication: Publisher, Page number (from-to).

Gobl G. (1994): Resuscitation. In: B. Bencze, G. Gobl (Ed.): Oxiológia. Budapest: Medicina Publishing, pp 55-95.

Edited book:

Editor(s) (ed or ed(s). (Year) Book title. Place of publication: Publisher.

Decsi T. (ed.) (2009): The feeding of sick children. Budapest: Medicina Publishing.

Author- free book:

Book Title. (Year of publication) Place of publication: Publisher.

Hungarian Statistical Yearbook, 2009 (2010) Budapest: KSH

Journal:

Author(s) name (year of publication). Article title. Journal title. Volume number, page number (from-to)

Bethlehem, J., A. Horvath, Zs. Göndöcs, S. Arctic, Boncz I., Oláh, A. (2010): The main factors affecting the health of rescue workers in our country. In. Medical Journal, 151 51st pp 2089–2098

Foreign articles (same as with Hungarian articles):

Grigory M., Al Qureshi (2010): Acute stroke management: endovascular options for Treatment. In: Semi Neurol 30. 5th pp. 469-476.

Manuscripts:

Author(s) name (year). Document Title. Manuscript.

I. Pálfiné Szabo (2008): The patients' satisfaction with the quality of hospice care department. Manuscript.

Reference to a lecture at a convention:

Artist(s): Title of the lecture. Place. Time.

Pálfi, F. (2005): The investigation of burnout among nurses: Lecture. Szekszárd, Hungary, Tolna County Nursing Association: International Nurses Day, May 6, 2005

Reference to legislation:

The legal title (the year of publication). Journal title. Volume number. Volume number, page number (from-to)

2010 XCII Law for amending of laws of health and social subjects for harmonization of laws (2010). Health Bulletin 60th in. 20th pp 2986-2989.

Received data, figures and tables:

Author's name. (Year of publication). Figure, table title. Pages (from-to).

Source: Zs. Füzesi, L. Tistyán (2004). Community program and the preparation process of scene. p.21.

Reference to electronic sources and documents:

Author(s) (or editor, organization, source of name) (year): Study, title or web address: subtitle (if any). The website name, website / URL, the time of the last download.

J. Nagy, T. Kovacs, Cs. Kövesdy (2010): The pleiotropic effects of vitamin D, particularly the cardiovascular system. In: Hypertension and nephrology, 14 6th pp. 265-272.

URL:http://elitmed.hu/upload/pdf/a_d_vitamin_pleiotrop_hatasai_kulonos_tekintettel_a_cardiovascularis_rendszerre-6551.pdf [Pécs. 2010.12.29.]

Light and Shadow (2007), drug prevention [electronic document]. Pecs: Foundation FORRAS, a DVD-ROM

Media programs (TV, radio, video)

Author(s) (director): The title of the document. The media type. The intermediary channel name. The broadcast date and time.

Mokos Tibor (2010): 20 Years of the Faculty of Health Sciences. Interview. TV. TV Pecs, 18:00, December 10, 2010

Standard

The standard letter and number used in the country issuing the standard. Standard title. Place: Publisher, Release date. Page.

MSZ ISO 690 (1990) Bibliographic references. Budapest: Hungarian Standards Institution, p. 22.

Appendix II
EBSCO journal article databases are

ACADEMIC SEARCH COMPLETE

Academic Source Complete is the world's most valuable and most comprehensive, scholarly, multidisciplinary full text database, which contains 7,900 full text periodicals, including 6,800 peer-reviewed journals. In addition to the full text of more than 11,900 periodicals and more than 12,000 publications including monographs, reports and conference presentations, it includes indexing and abstracts. The database PDF content dates back to 1887, and the majority of searchable full-text materials are in PDF format. Searchable quotes are available for more than 1400 journals.

BUSINESS SOURCE PREMIER

Business Source Premier is the industry's most used business research database including more than 2,300 full-text versions of journals. The database dates back to 1986 and contains full-text materials and dating back to 1998 it also includes references cited. The database is updated daily via the EBSCO host search system.

REGIONAL BUSINESS NEWS

This database contains full text versions of regional business publications. Regional Business News covers more than 80 metropolitan and rural regional business publications of the United States of America.

MEDLINE

The MEDLINE database provides medical information, professional guiding in medicine, patient care, dentistry, veterinary medicine, the health care system, preclinical sciences and many other branches of the field of medicine. The MEDLINE database was created by The National Library of Medicine and uses the index of the MeSH (Medical Subject Headings - medical subject heading system).

ERIC

The ERIC (Educational Resource Information Center) is an American national educational information system which includes more than 1.3 million records and contains more than 323,000 full-text document references back to 1966.

PREMIER MASTER FILE

Designed specifically for public libraries including multidisciplinary database containing more than 1,730 general reference publications with full-text version from 1975 onwards. The master file in the Premier database covers all areas of general interest. The database is updated daily.

HEALTH SOURCE – CONSUMER EDITION

This database is accessible from the libraries of the world. It is the richest consumer health information collection which covers areas such as medicine, nutrition, childcare, sports medicine and general sanitation. The Health Source: Consumer Edition contains more than 80 full-text consumer health magazines.

HEALTH SOURCE: NURSING / ACADEMIC EDITION

The database contains nearly 550 full-text academic journals from many medical fields. The Health Source: Nursing / Academic Edition includes the Lexi-PAL Drug Guide database which covers the patient information material of 1300 generic medicines containing more than 4,700 brand names.

LIBRARY, INFORMATION SCIENCE & TECHNOLOGY ABSTRACTS

The Library, Information Science & Technology Abstracts (LISTA) indexes more than 560 complete journals, nearly 50 journals with partial access and nearly 125 selected journals as well as books, research reports and presentation materials. The collection includes the topics of librarianship, classification, cataloguing, bibliometrics in the online information retrieval and information management. The source material goes back to the mid-1960s.

GREEN FILE

The green file provides information supported by researches, it covers the impact on the environment of people in all aspects. The collection includes material of scientific, administrative and public interest, topics on global warming, green building, pollution, sustainable agriculture, renewable energy and recycling materials can be searched. The database contains more than 384,000 records, includes abstracts and indexing, as well as free access to over 4,700 full text records.

NEWSPAPER SOURCE PLUS

Newspaper Source Plus contains more than 700 newspapers with full texts and more than 31 million articles with full texts. The database contains more than 699,000 television and radio news transcriptions with the full text.

Appendix III
The Electronic Information Service (EISZ) includes the following databases at present:

WEB OF SCIENCE

The Web of Science (WoS) is the bibliographic database of ISI (Institute for Scientific Information.) It is an inter-disciplinary database which can contribute to the whole area of science by the weekly updated material which it regularly provides. It standardises according to scientific criteria, and provides versatile search, it reviews about 8,700 high-impact journals. A feature of the WoS is the citation index which reveals author references. The Web of Science databases are divided into three main areas of science: Arts and Humanities Index, Index of Natural and Technical Science and the Social Sciences index.

SCIENCE DIRECT

Science Direct is the full-text database service of the scientific publisher Elsevier. Its main profile is spreading scientific, technical and medical journals in print and electronic form. It provides full-text access to the electronic versions of self-published paper-based journals and to other e-journals of other publishers.

SPRINGERLINK

SpringerLink is one of the world's most comprehensive online collections of scientific, technological and medical journals. The service currently has more than 1,600 journals available from 1997 in full text, including the following disciplines: life sciences, chemistry, earth sciences, computer science, medicine, physics and astronomy, engineering, environment, jurisprudence, economics, social science.

We can both search and browse in journals on the interface which is easy to use, and the search can be narrowed in several ways. Full Text PDF printable (and sometimes even HTML) format is available, with colourful graphics in certain cases. The publications include an index, a bibliography, and sometimes even an author index. You cannot download whole issues at one time.

JOURNAL CATALOGUE OF THE AKADÉMIA PUBLISHING HOUSE

The publications of the Akadémia Publishing House provide the opportunity for our scientists to publish the latest results in nuclear chemistry, microbiology and linguistics, in more than 40 scientific disciplines. More than 50 journals have been available free of charge for EISZ users since 1999. The articles can be searched on basis of author, title and abstracts, and full printing with the same content (full text) can be downloaded in PDF format. The latest journals are available online several weeks before being published in print.

ACADEMIC ELECTRONIC LIBRARY

This includes dictionaries (English, German, French), concise dictionaries (Spanish, Italian, Dutch), the Dictionary of Foreign words and phrases, the Environment lexicon, the Dictionary of Hungarian-English environmental protection, English-Hungarian financial and technical dictionaries, German-Hungarian technical dictionaries, Hungarian manual dictionary, Encyclopaedia of New Hungarian Literature, Hungarian Thesaurus and the terminology dictionary of the European Union.

PSYCINFO

PsycInfo is the online database of APA (American Psychological Association - American Psychological Association). The database is available on the platform of Ovid and it includes journal articles, books, book chapters, research reports, descriptions, summaries of theses and citations from the fields of psychology and sciences (psychiatry, physiology, neurology, anthropology, medicine, social science, education, social work, linguistics, law, etc..). It is updated weekly.

LECTURE NOTES IN COMPUTER SCIENCE

The full text book series of Springer Publishing House reports all the latest research, development, education results in all the areas of information technology, computer science, artificial ntelligence. The issues after 1997 are available in full text (the issues published before 1997 are not digitized, but you can browse in the tables of contents). Full text printable PDF (and sometimes even HTML) format is available, at the same time the total volume cannot be downloaded.

SCIENCE MAGAZINE

Science Magazine is an important source of research. Between 1999 and 2004 the magazine had the highest impact factor on the following six disciplines: molecular biology and genetics, physics, biology and biochemistry, botany and zoology, space science, immunology. It includes maintained links to related resources such as PubMed, ISI and more than 944 scientific journals on Highwire platform.

NATURE JOURNAL COLLECTION

Publications and services belonging to the NPG include the journal Nature, science research journals and reviews and many educational journals as well. Nature, which has been published since 1869, is the world's most cited, multidisciplinary weekly paper.

REAXYS

Reaxys is Elsevier's new chemical database which is rich in experimental materials and the data sets of chemical reactions, and it was created by merging the database of the prestigious Beilstein, Gmelin and Patent Chemistry. Chemists can find the most important information of inorganic chemistry in this database.

MLA INTERNATIONAL BIBLIOGRAPHY

MLA International Bibliography is the database of Modern Language Association of America, founded in 1883. It is the only comprehensive bibliography of the field of literature and grammar, available in print and online as well.

LRC (LITERATURE RESOURCE CENTRE)

Literature Resource Centre is the world's most current, most comprehensive and most reliable online literature database. It is unique in today's biographies, it is a treasure house of reviews, and bibliographies. It has a complex approach to texts, it develops a critical mind set. Users can find the information related to the writers or to their works at all levels of knowledge concerning any era, from all over the world.

ACM DIGITAL LIBRARY

The Association for Computing Machinery Database contains bibliographic information of journals and conference proceedings published by the ACM and their electronic versions in full text from 1985. Main topics: artificial intelligence, computer networks, computer programming, programming languages, computer graphics, simulation, software engineering, human-computer interaction.

MATHSCINET

The MathSciNet is a mathematical and scientific database which contains abstracts and bibliographic data. The bibliographic data are included from the beginning of the 1800s.

THE GROVE DICTIONARY OF ART (GROVE ART ONLINE)

Grove Art Online is today's most comprehensive encyclopaedia of art, a virtual art manual library which covers all aspects of both Western and non-Western visual arts disciplines.

GROVE MUSIC ONLINE

Grove Music Online has been the leading database of online music research since 2001. The Classical Music Library and DRAM and RILM music bibliography are available by links.

Centre of Agricultural and Biosciences International – CAB ABSTRACTS

CAB started as an abstracting service in agriculture in 1932, now it is called the Centre of Agriculture and Biosciences International (CABI). It monitors the topics in agriculture, veterinary medicine and related biological, economic, commercial and legal issues. Its material has been processed back to 1973 in computerized form. The number of records are estimated at over four million, its annual growth is 160,000. The service includes the Index Veterinary, the Veterinary Bulletin and the content of other abstracting journals of CABIN (in full) Patents, national periodicals not published in a world language, reports and the so called grey literature are all processed, provided they have a summary in English.

FOOD SCIENCE AND TECHNOLOGY ABSTRACTS - FTSA .

The FSTA has been in existence in the form of an abstracting journal since 1969, its producer is the IFIS (International Food Information Service, Reading, England), an international non-profit organization. The FSTA monitors about 1800 publications, periodicals, standards, laws, patents, books, theses and conference publications in 40 languages. Agricultural, animal husbandry, and veterinary issues can only be taken into account if they are related to food quality. The number of its records is 550,000, growing by 20,000 annually.

ZOOLOGICAL RECORD

Zoological Record is the world's oldest continuously operating database of animal biology. It is considered to be the world's leading taxonomic reference site, since 1864 it has been the non-official record site of animal names. Its topics include all aspects of animal biology, environment description, taxonomy and veterinary sciences.

ECONLIT is the electronic bibliography of the American Economic Association, the indexes of which cover more than thirty years of economics literature from all over the world. EconLit is the comprehensive index of journal articles, books, book reviews, drafts and theses. Its search interface is simple and clear.

JSTOR – in full

The JSTOR database contains the full text of more than one thousand journals in 24 disciplines in English. The database is an archive of retrospective character, of high scientific quality, and it is interdisciplinary. It is the result of joint, committed work of several thousands of libraries and cultural heritage institutions, hundreds of leading scientific publishers, and many scientists. The digital archive is a community research platform compiled by scientists and researchers, founded in 1995. The JSTOR archive collection extends to almost all branches of science, from humanities through social science to natural sciences. Scientists, teachers, and students use the search module of JSTOR, which offers a lot of opportunities for their research on a daily basis around the world. Every institution within the frames of EISZ can have access to the full text of articles of the journals found in the packages required by them.

TEST READY

The Ready for Test program, which processed authentic language exam tests of ORIGO language exam (Rigó utcai) was published by the co-operation of the Akadémiai Publishing House and the Foreign Language Training Centre (ITK) in English, German and French.

DICTIONARIES PUBLISHED BY SCRIPTUM

The dictionaries can be searched by the web interface of the database management and information retrieval system of GIB (Graphical Interactive Book), all the information stored in the electronic database can be checked independently or in certain combinations. The search options are extensive (titles, subject terms, expression, meaning, part of speech, profession, etc.).

Appendix IV
The selected journal list of health science

Addiction and Health
Archives of Public Health
BMC Health Services Research
BMC International Health and Human Rights
BMC Public Health
BMC Women's Health
Bulletin of the World Health Organization
Californian Journal of Health Promotion
Cost Effectiveness and Resource Allocation
Emerging Themes in Epidemiology
Epidemiologic Perspectives and Innovations
Global Health Action
Global Health Governance
Health Care and Informatics Review Online
Health Reports
Health Research Policy and Systems
Healthcare Review Online
Human Resources for Health
The Internet Journal of Allied Health Sciences & Practice
International Journal of Collaborative Research on Internal Medicine & Public Health
International Journal of Environmental Research and Public Health
International Journal of Health Research
The Internet Journal of Epidemiology
The Internet Journal of Healthcare Administration
The Internet Journal of Toxicology
Journal of Environmental and Public Health
Journal of Health Science
The Journal of Toxicological Sciences
Journal of Toxicology
MMWR : Morbidity & Mortality Weekly Report
Open Epidemiology Journal
Open Health Services and Policy Journal
Open Public Health Journal
Open Toxicology Journal
Risk Management and Healthcare Policy
Social Medicine
Weekly Epidemiological Record

Appendix V
Other relevant databases

CD Collection of Laws: Laws and resolutions of the Parliament in the database of the Gazette of Publishing Ltd. CompLex. It is updated once a month, after the closure of the plate of CompLex Collection of Laws. Statutes are the same as the adopted and propogated text but the amendments are not included. Available at http://www.lib.pte.hu, directly on http://kozugy.kerszov.hu .

Electronic Periodicals Archive Database

It includes the registration of Hungarian e-periodical publications with library demands and archives of particular journals. The aim of the service is to build and make a catalogue which is standardised and can be retrieved in several ways. Electronic periodicals are ever more available as well as stable methods of display for an increasing number of digital periodicals, in order to promote users to be more informed in the world of e-periodicals. The majority of archived texts can be searched in full text. The stock is growing on the one hand by the items uploaded recently, on the other hand by the updated issues of already archived publications. The database is available directly from the site http://epa.oszk.hu and http://www.lib.pte.hu .

THE ELECTRONIC COLLECTION OF LAWS IN FORCE today includes (except the municipal regulations) the laws and the text of other legal resources of state control and any amendments in unified structure and in force today. It is notified by MEH Electronic Government Centre. It is distributed free of charge, it is a Hungarian speaking database which is constantly updated. At Https://kereses.magyarorszag.hu/jogszabalykereso and http://www.lib.pte.hu .

CENTRAL STATISTICS OFFICE (CSO) DATABASE

It meets the demands of a wide range of users for information. It unifies the theme structure of its comprehensive database (yearbooks, pocket books, DATA-tables, information database) from 2007 for the convenience of users to get information. Accordingly, DATA-tables are arranged around seven major themes:

1st Population, movement
2nd Society
3rd General economic indicators
4th Economic branches
5th Environment
6th Spatial Data
7th International data

Within the main themes the sub-groups help further searches. In 2007 the annual and interim data tables were separated and it meant a greater change in the structure of the tables. The longer time series of the annual data provide in-depth information on domestic social and economic situations. Through the shorter time series of the interim data, monthly and / or quarterly changes can be monitored. Longer retrospective time series of the major indicators are also available. The tables are static, the preliminary data are marked in blue, while the data patches of earlier years are marked in green. A methodological guide helps the interpretation of the tables. If more detailed information is needed, the name, phone number and e-mail address of experts of particular disciplines can be found below the tables. The tables are free to download and print. Direct access: http://www.ksh.hu and http://www.lib.pte.hu .

PAD TEACHING DATABASE (PAD)

The Education Database (PAD) of the National Educational Library and Museum (OPKM) includes the complete material of the national professional bibliography of Hungarian Pedagogical Literature since 1989, as well as the data, processed in OPKM (in full) , of the foreign language professional books and selected journal articles. The database includes educational theory, education, public education, training, teaching methodology, educational psychology, history of education, education sociology, special education. Data source: pedagogical books published in Hungary, in the analytic exploration of the major collection of works, the subject articles of Hungarian-language educational journals and selected articles, available in the OPKM file, of foreign-language books and foreign language journals. The major part of foreign language documents and abstracts also includes a network address and a title translation. The documents which can be found in the database are available in the OPKM file. The database is continuously expanding in the emerging information and documents previously released and processed retrospectively. The database is available on http://www.lib.pte.hu and http://www.opkm.hu.

SOCIOWEB: A Web version of sociological information. The selected bibliographic database of the Hungarian-related sociological literature which is monitored by the Central Library of the Metropolitan Szabó Ervin Library, the national reference library of sociology. It is based on the database of sociology in its broadest possible interpretation and on the most extensive range of the border areas, and it represents more than 30 years of Hungarian and Hungarian-related foreign sociology. The thematic search is promoted by the broader topics covering sociology and its border areas and by the subject head-

ings describing concepts in detail, mostly organized in thesaurus, as well as by brief annotations completing the titles. The subject heading system is the result of the continuous development of the library. The database search interface is in English as well and it contributes to the international promotion of Hungarian sociology. The bibliographic entries can be retrieved on the basis of foreign language title translation. The English-language versions publish the English language extracts in full text of three basic sociological journals. Most of the documents can be found in the Metropolitan Szabó Ervin Library. Free access, updated quarterly. Available at http://www.lib.pte.hu/adatbazis and http://www.fszek.hu .

Appendix VI
Examples of domestic and international medical and health websites

One part of health websites are for professionals, the other part is for the layman. The construction of several websites is complex, when you enter, you can select which target group you belong to (e.g. physicians, health care workers, pharmacists, laymen) on the front page and which part of the web space you want to browse.

InforMed

http://www.informed.hu

InforMed is a health website established in 1995 on the basis of the database of Pro Patiente. The aim is to provide professionally authentic material written or supervised by doctors as well as giving those individuals who are unwell and the people who wish to preserve their health lifestyle, advice. Technical information which is displayed on the page, of course, does not replace but complement the relationship between patient and doctor. The electronic version of professional journals, in many cases the full text versions are available for the doctors and health care workers registered on professional sites.

eLitMed.hu

http://elitmed.hu

ELitMed.hu portal provides full access to scientific publications in Hungarian as well. By the help of eLitMed.hu grounded, useful and timely information is provided about healing and the achievements of medical and health sciences, and health - with all the social, economic, philosophical, ethical and legal aspects. Scientific, intellectual and cultural history materials which have been published in print in the last 18 years, can easily be achieved in a clear, searchable manner on the portal. The current issues of journals of Ca & Bone, Hypertension and nephrology, Neurological Review, LAM (Lege Artis Medicinae), LAM Extra for GPs, Hungarian Immunology, Hungarian Radiology and the previous articles of the periodicals in the archives are available on the site.

medicalonline

http://www.medicalonline.hu/index.php

The current and previous issues of magazines of Medical Tribune, Postgraduate Medical Review, Medical Review of Obstetrics and Gynaecology, Postgraduate Review of Paediatrics, Journal of Clinical Oncology, Current Opinion in Haematology are available.

Journalseek – search of foreign journals

www.journalseek.net

Genamics Journal Seek is the largest journal information database available online. It currently contains 94,964 titles. The database contains a brief description of the journal, its abbreviated title, the availability of its website, its subject headings and its ISSN number.

WHO – World Health Organization

www.who.int

The World Health Organization (World Health Organization, WHO) is one of the organizations of the United Nations which operates as the coordinating authority for international public health. Its task is to provide global guidelines in the field of health, working with governments in national health programs, in planning, managing and evaluating them. It also provides the appropriate health technology, information and standard development and transfer. It performs aid, research and managerial activities in all areas of health protection, especially in exploring the causes of infectious diseases, epidemics of childhood diseases, heart and circulatory disorders, cancer and AIDS, concerning the nature of the diseases, their prevention and treatment.

Basic terms

Abstract (abstract): A short extract which gives a summary of the content of the publication, its relevant findings and results. Synonyms: summary statement, extract.

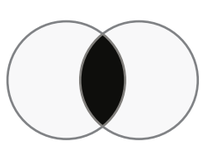
Database: a systematic collection of information stored on a computer, a set of records consisting of data fields. It is a database with a logical structure, for storage and retrieval of computer files.

Bibliography: List of literature, or professional literature, a systematic list of the titles of documents in a given topic or about a given author.

Bibliographic data: parts of the bibliographic entry, which represent the most characteristic features of the documents (author, editor, title, publication place, publisher, year of publication etc.). The bibliographic data provide short descriptions of the documents and help to identify the document clearly.

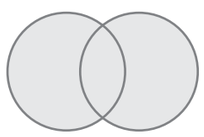
Boolean operators: Signs of operation describing the relationship between each search term in a computer database. The operators, which are the following, have to be written in capital letters:

AND (AND): where both search terms can be found. The order is irrelevant, so A AND B corresponds to B AND A.

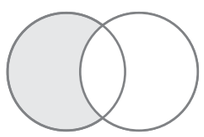


OR (OR): everything that is related to one or to the other concept is displayed in the result set. It is a broader set of results concept.

This operator is used when similar terms are to be collected.



NOT (NOT): excludes one of the queries. By using it the relevant results can be excluded.



Truncation: the program is looking for everything that starts with the character series before the truncation sign ° of. Words can be truncated from the front, but usually not from both directions simultaneously. Signs: ? ; %, $ or *.

Google Scholar: it runs crawlers on the web (auto-seekers) and organizes the data collected in a database. By this it extends them on the full web interface, but this is a limitation: you will find only the publications available on the web, and it processes everything uncontrolled, wrong / misleading / false information as well, if they appear on the web. In addition, it cannot distinguish the same authors' names and the relevant citations related to them.

Keywords: an expression in the document title, subtitle and in its extract.

Meta Search: The search engine of search engines. Due to the different properties of individual searches they provide different sets of search results to the same question. Meta search engines simultaneously search for each query on search engines and provide a variety of optional standard services for arrangement such as Google, Yahoo, Ariadnet, Heureka.

Multidisciplinary database: a summary database relating to interdisciplinary fields and based on multi-disciplinary fields of science.

OPAC: Online Public Access Catalogue means a catalogue freely available on any computer network.

Relevant literature: it is professional literature providing subject related important, relevant, recent researches and results.

Subject heading: a term revealing the content of the document professionally.

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7. Fundamentals of Research Methodology and Biostatistical Knowledge

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Introduction

Each of the previous chapters in this book is built on knowledge discovered and proven by science, within that primarily medical science. But how does new knowledge arise, what is the process of its generation like, what are its conditions, through what methods can it be achieved, how do scientific issues become proven recognition and part of practice? This chapter aims to address these issues by summarizing the methodological foundations of scientific research. The present chapter will briefly present fundamental research methodological and biostatistical knowledge, and lead the reader along the process of scientific research, helping them to carry out simple research.

It is an essential condition of efficient and fruitful work that nursing professionals working in nursing and medical attendance follow practices based on evidence. They should choose the solution, the nursing task that is the most fitting for the particular problem, and which is based on up-to-date, scientifically proven knowledge.

Sources of knowledge for professionals working in nursing and medical attendance

In the course of our studies, work and especially scientific activity, it is inevitable that rationalism, logical argument, substantiated statements are used..

In everyday life information can be obtained in two ways. Knowledge and experience may be accepted and mediated by others.

In the course of scientific cognition the aim is to find objective, proven knowledge. In this approach a statement can be accepted as long as it has been considered as logical and it must be supported empirically.

Sources of scientific – and also lay – knowledge may vary, the most typical are presented here briefly which are most frequently used by healthcare employees during their work:

Following customs and traditions

When daily tasks are fulfilled, the knowledge applied and the customs followed are the ones that have been acquired in our immediate environment and are mediated by others. Traditional knowledge creates safety and confidence, and they appear in the form of well-practised tasks in the work processes of nursing or other healthcare professionals.

However, traditional knowledge can also be an obstacle to development, since it is hard to change routine-based habits and fixed knowledge, and make people accept new knowledge and methods. There may be a lack of new knowledge in the background, or interests may be harmed when new customs are formed, and a lasting difficult working atmosphere caused by the change, the constraint to change. Despite all this it is useful to rethink the traditional knowledge base from time to time, and to keep processes and knowledge under logical control.

Following the position which is taken by an authority, professional office, agency

In the course of applying traditional knowledge, a knowledge base accepted by consensus is used. However, in several cases it may happen that the source of knowledge is not the generally accepted theory but an external authority, office or agency regulate the activities. This type of knowledge usually appears in the form of professional principles, rules, protocols. In this case the user cannot deal with the appropriateness of knowledge, their duty is to observe it. Examples of this are methodological letters which serve as basis for protocols applied in healthcare.

Following intuitions, instinctive anticipations

Practice built on intuition is not based on rationalism but on anticipations gained through experience. According to research findings, in such cases, intuition, perceived as knowledge which forms activity, arises as a result of complex interaction of expertise, practice, general knowledge, personality and environmental effects.

Trial, experience: successes and errors

In nursing and medical attendance it may occur several times that knowledge used many times or practice which worked well in the past do not generate the expected result. In such cases healthcare specialists try to achieve the desired result with newer and newer methods: e.g. they want to achieve the movement of the patient using new motivation, they help to reduce calorie-intake with a new diet, as an example. The method of trial and error makes it possible for the specialist to gain a lot of experience. Experience, although obviously useful, may well limit cognition. That is, individual experiences may often have different findings from scientific discovery, and then it is difficult to reconcile them. In this case the main task is to accept proven scientific knowledge, not denying but also not generalizing the result of individual experience either.

According to Parahoo (2006), reflective practice is a possible method, which should be applied, of knowledge extension during which the nurse thinks through the reason for her activities in each of the stages of the nursing process. According to Schön (1987) there are two possible ways of reflection:"reflection-on-action" and "reflection-in-action". The former means follow-up analysis, evaluation of a series of activities, while in the second case continuous self-inspection is carried out during the work process. Reflective practice is a learning practice, it mostly improves practical tasks, since questions have to be answered such as what I am doing, how I am doing it, why I am doing it.

Cognition of scientific research findings

It is certainly not a surprising statement that scientific research provides the most accepted and the most reliable knowledge for specialists. According to the – unusual – formulation of anthropologist Zora Neale Hurston, scientific research is the following: "Research is formalized curiosity. It is restless searching for answers with a purpose". As Albert Szent-Györgyi puts it in his well-known statement: "Research is to see what everybody else has seen, and to think what nobody else has thought."

According to the usual and formal definition, after determining the research problem and formulating a question the researcher collects data in an organized and orderly way, processes and analyses the data, and publishes them in accordance with the required content elements and form of scientific publications. The result of the scientific research in itself is not the solution to the research problem, but it helps to understand the examined phenomenon, recognize its characteristics, and together with this accept or deny the facts known so far.

The process of scientific research

As it was mentioned before, in the course of scientific research "after determining the research problem and formulating a question the researcher collects data in an organized and orderly way, processes and analyses the data, and publishes them in accordance with the required content elements and form of scientific publications". The process of research has stages described below (Figure 1):

Formulation of a research problem

Research interest can be raised by varied problems and issues. They may include among others:

- problems of everyday practice which have to be solved;
- rethinking theoretical items of the particular field of science, examination of their validity and reliability;
- seeking answers to questions left open in literature;
- claim for scientific evidence for personal intuition, observations, beliefs that arise in the course of professional work.

Exact identification, research purposes made obvious are an indispensable condition of the formulation of a research problem. An exact, identified problem designates the purposes which are to be achieved, and it designates the necessary data sources as well.

An essential professional problem has to be defined as the research subject, it has to fit in the particular discipline, its important aspects are that it can be researched, the empirical examinations can be implemented in practice, and the expected results can be utilized and applied. There are several conditions of research feasibility, which are only listed here, but in case of concrete research it is worth devoting due time to think through all of them:

- the time available to carry out the research, and its scheduling;
- availability and willingness of co-operation of people involved in the research;
- research instruments at disposal;
- raising financial resources,
- research experience and commitment;
- ethical considerations.

It is worth making a research plan in the first stage of research, which leads you through the whole process. The conceptual model of the process may throw light on the difficulties of implementation, maybe on problems that cannot be solved, but more importantly, it is to create a process built on a research plan which describes the whole research and is ultimately coherent. Making the plan is not a simple task at all, but it urges (forces) the researcher to define the stages of his research work in a professional way.

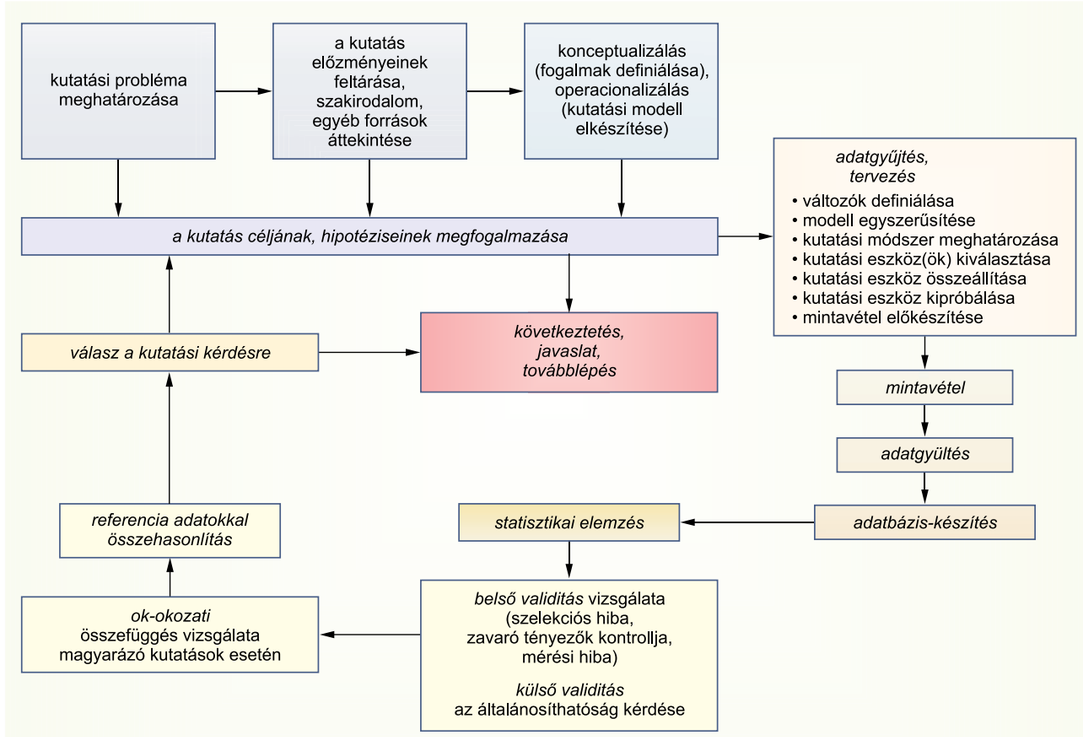


Figure 1 The course of research process

Source: own compilation

Exploration of previous research, review of literature and other sources

It is important for the researcher to get to know the theoretical and empirical findings of available knowledge, the main research groups, the debates concerning the research topic, contradicting views, methodological instruments applied in researching the topic, limits of researching the topic, its difficulties etc. An outstanding importance is attributed to literature review, so it is dealt with, in a separate chapter entitled 'Literature Research in Nursing' (Chapter 6).

Development of conceptual frameworks of research

When starting the research, it is important to form the theoretical, conceptual framework within which the research problem, related concepts, variables that will be applied and the hypotheses to be answered will be interpreted.

Identification of theories ensuring the research framework

An important turning point of starting scientific research is when a response cannot be given to a problem that has arisen on the basis of existing knowledge. However, it does not mean that research can be started or carried out without it being theoretically determined. It is difficult for research which lacks theoretical framework to fit in scientific knowledge that has accumulated so far. Existing knowledge determines research questions asked, helps to develop instruments, analyses, interpretations that can be applied in research.

A theory, in an abstract and generic way, provides rational and systematic explanations for the presented phenomenon, its causes and system of connections. They are comprised of statements each of which are inferred from the other, generating logical explanations to explain phenomena.

Scientific theories can be grouped in several ways, the two most frequently adopted are descibed briefly:

according to the generalizing, comprehensive character of theories:

- grand/macro theories – they formulate the whole of the phenomenon in a conceptualized, comprehensive way, it is difficult to test them empirically;
- middle-range/meta theories – a detailed presentation of a phenomenon which can be well-defined, as well as its occurrence, causes and consequences are interpreted in an empirically supported way;
- laws – a theory which describes the regular operation of a particular phenomenon: in natural sciences laws are function-like (the phenomenon always happens under given conditions), in social sciences they are of probability character (the phenomenon occurs under given conditions with a predicted probability).

according to the character of the theory:

- descriptive theory – characteristics, dimensions of the examined phenomenon, group are described (main questions are: what is it?, what is it like?);
- explanatory theory – in addition to the characteristics of the examined phenomenon, it analyses the internal and external links, provides explanation for emergence/existence of the phenomenon (main questions are: what is happening?, how is it happening?, why is it happening?);
- predictive theory – it examines the causes and consequences connected to the change of phenomena (main questions: what consequences are there?).

In nursing research metatheories or laws describing phenomena are the most frequent, and descriptive and explanatory theories are usually applied, but predictive theories are getting more and more common theoretical frameworks for research.

Measurement methods and data types

Measurement is when numbers are assigned to information gained through research according to some rule. ref Some attributes of the examined persons and phenomena are quantified by these numbers, and they are called data in research. In the course of scientific research the data is evaluated, and through them researchers try to obtain as much information as possible concerning the examined group or phenomenon.

Two groups of data are differentiated: quantitative and qualitative. Quantitative data describe the amount of the measured variable (e.g. blood pressure value, temperature, cholesterol level, body weight etc.), qualitative data, describes the type of observations to which numerical whole values are assigned e.g. smokes (=1) and does not smoke (=2).

Basically there are four different types of measurement level to record the data depending on what content, the measured, observed values have. Measurement levels concern the examination plan and data collection; they crucially determine the course of examination. Furthermore statistical methods are scale-dependent as well.

- Data that can be measured and stated on ***nominal scales.*** They arise in questions of questionnaires and interviews. Symbols and numbers are only for identification by which a clear classification of phenomena and processes are possible. The numbers do not express differences in quantity or order, they are used for coding the categories. Examples: gender, marital status, citizenship, wearing glasses.
- ***Ordinal scales:*** the measured data are ranked. This type of data is obtained when the task of the respondent was to establish the order. There is a clear order of numerical values assigned to data, it is obvious which is greater, better, smaller or worse. However, it cannot be established exactly how big the difference is between the ordered data. Examples: types of towns and villages, school marks, self-evaluation of health condition, degree of satisfaction.
- ***Interval scales:*** the interpreted data have a clear and known order, but in addition to that there is an equal distance between any two adjoining values both in terms of numbers and content. This means for example in the case of taking temperature that there is the same difference between 36 degrees and 37 degrees as there is between 37 and 38 degrees. However, there is no fixed starting point (0 point) on the measurement scale, it is arbitrary or based on convention. Examples: body temperature, blood pressure, intelligence quotient.
- ***Ratio scales*** are the most rigorous measurement level where in addition to order and equal distance betwen the data, the ratio of their differences becomes measurable as well. If in a lifestyle programme someone has lost 20 kilos, while the second participant has only lost 10 kilos, then it is known exactly that the first person has lost twice as much as the second person . With this measurement level the starting point (0 point) makes real sense, since going back to our previous example we know exactly what it means not to lose even a gram, or if something is non-existent, that is 0 kilogram. Examples: body weight, height, pulse, income size.

Definition of variables

In order to analyse, interpret data gained in the research process it is neccessary to assign numerical values to findings, to develop variables thus ensuring – taking into consideration certain conditions – that the data of particular research elements or persons can be compared.

Variables can be ***categorical or numerical*** variables. Categorical variables do not express quantitative or qualitative values, only certain cases of the examined characteristic are differentiated by them. Such variable is for example the religion or gender of the individual, which has two so-called attributes/values: 1-male, 2-female. With numerical variables the value of the variable already expresses the order among the individual values, moreover sometimes the distance that is between them, can be measured and also denoted by them. Examples of variables include income or consumed alcohol quantity data.

Numerical variables can be further divided: discrete and continuous variables. The possible values of discrete variables are limited, e.g. the number of children in a family can only be a whole number, and it rarely exceeds – in Hungary – 6-8. As opposed to that, age can be considered a continuous variable. The borderline between discrete and continuous variables is somewhat arbitrary, but in practice a variable can be considered continuous if the number of possible values is more than 20.

The variables applied in research can be independent and dependent according to their role in the examination of correspondences. Independent variables are the causes in the cause-and-effect relationship, and their change affects the changes in the effect, which is the dependent variable.

Formulation of hypotheses

A hypothesis is a proposition, an assumption about the expected outcome of the research, which is intended to be verified or refuted in the course of research. The hypothesis can be logically deduced on the basis of theoretical knowledge and is intended to be supported by data gained from empirical research.

In the research hypothesis propositions can be made about characteristics concerning the research topic, causative, connection relations. That is why the hypothesis is the guideline of research, which determines what should be researched. It is an important characteristic of a good hypothesis that it possibly directs towards new knowledge and approaches, it exceeds previous knowledge or challeges it. Hypotheses show the direction of data collection, based on which factual data are collected, and the relationship between them is explored. If it is possible, several hypotheses have to be formulated about a scientific problem. Hypotheses must always be checked, because only in this way can the relationship between theory and experience be established.

Let us go over the necessary components of a hypothesis with the help of an example.

Hypothesis: Higher qualification results in higher participation in breast cancer screening.

- definition of independent and dependent variables (qualification – participation in screening);
- the form of relationship between the independent and the dependent variables;
- the direction of change caused by the independent variable (higher qualification means higher participation);
- identification of those involved in the examination, the population (geographical characteristics, age and other characteristics of the sample can be determined in the hypothesis).

Requirements in connection with hypotheses can be summarized in the following way:

- a hypothesis should be adequate – it should concern the research problem, and include the characteristics of a certain phenomenon;
- it should be conceptually clear and unambiguous – correct definition of related concepts, that is conceptualization is already necessary at this stage;
- it should be simply and concisely formulated;
- it should be supported by existing knowledge, factual and theoretically established;
- it should be empirically testable;
- it should be connected to existing technical tools – a hypothesis for which there are technical tools available should be formulated, but at the same time they might encourage the deelopment of new research instruments;
- the relationship between the variables should be established both logically and theoretically;
- it shoud not be trivial, it should focus on a question that really needs to be answered.

Hypotheses appear in two forms which are detailed in part 3.8.2. of this chapter.

Determination of research methods

When methods of scientific research are determined, decisions must be made whether they utilise qualitative, quantitative or both methods, in order to achieve the aims of the research. Both methods have long been used in social as well as natural sciences.

Quantitative research methods

Quantitative research methods date back to the beginning of nursing research, since quantitative data collection was followed by Florence Nightingale as well. The fundamental principle of the quantitative research method is that essential tools in the process of gaining knowledge are the collection of large quantities of data on a wide range, systematic, regular and uniform measurement and assigning numerical values to data, because answers to research questions can be given based on this. Quantitative research is generally of a deductive character, typically the researcher collects data

on a large sample in order to be able to verify their hypotheses or outlined theoretical propositions. Choosing a sample is an essential element in quantitative research, since reliable findings can only be achieved by using a sample which represents (maps) the population to be examined correctly. With this type of research – because of the large sample – it is indispensable to use mathematical-statistical methods, and the findings of research are also published in a numerical form taking into account the requirements for statistical reliability examinations. Its main research instrument is the survey technique, that is the application of questionnaire surveys. In addition to that, there are several other instruments, such as structured interview, structured observation. In nursing research, quantitative research is applied e.g. in the examination of satisfaction, needs, health condition and its influencing factors.

Qualitative research methods

Detailed and exhaustive exploration of the researched area is carried out through qualitative research. Generally a small sample is used, which is not aimed at being representative. Interaction, inductive approach, flexibility and reflexivity are typical of examinations carried out with the qualitative technique. There are no predetermined questions as with the survey technique, only the main sets of questions are the same since one of the essential tasks is to highlight individual characteristics. Typical qualitative research methods are observation, experiment, in-depth interview, specialist interview, focus group or case study. Qualitative research is often used in examinations to learn about people's beliefs about illnesses, to explore doctor-patient, nurse-patient relationship problems, to examine motivations that influence patients' co-operation for example.

Forms and practice of sampling

Concepts related to sampling

Sampling means determination and selection of those to be observed. Sampling selection determines the reliability and validity of conclusions drawn. Before reviewing the possible methods of sampling, some essential concepts have to be clarified whose understanding is indispensable for undertaking out correct sampling techniques.

- ***Representativeness:*** a sample represents the base population from which it was taken if its aggregate characteristics approximate the same aggregate characteristics of the population. It is not necessary for the sample to be representative in every aspect, representation is limited to the important characteristics for the concrete research.
- ***Population:*** theoretically determined aggregate of the elements to be examined, the aggregate people, things that meet the preconcieved selection criteria, and about whom conclusions are to be drawn.
- ***Examined or target population:*** the aggregate elements from which the actual sample is taken.
- ***Element:*** basic units about which information is gathered, and which serve as basis for analysis. It is generally people, but they may be inanimate things for example hospital beds or wards. The analysis unit is related to data collection, whereas the element is related to sampling.
- ***Sample:*** aggregate elements.
- ***Sampling unit:*** those elements or group of elements which are taken into account at some stage of sampling for selection.
- ***Sampling frame:*** list or quasi-list of elements from which the probability sample is selected.

Types of sampling procedures

Non-probability sample

It does not ensure representation, consequently the conclusions that can be drawn are limited. Elements typically have a smaller, or a greater chance of being selected into the sample. Forms of non-probability sampling:

Accidental sampling: Subjects among our acquaintances, students or colleagues who are easily accessible when the examination is implemented. Its use may be justified if the researcher is interested in those very people who 'cross', who are present at a given time, at a given sampling point, or the implementation of other methods cannot be managed. This method is suitable for use in preliminary testing of questionnaires, its advantage is that it is fast, comfortable and cheap.

Purposive or purposeful sample: The researcher knows what kind of subjects is needed, and finds them according to their own judgement. This method is mainly but not exclusively used in qualitative research.

E.g. research in connection with chronic pain of the lesser pelvis was carried out among GPs and practising nurses. Purposive sampling was supported by the list (of nurses, doctors) available for everyone in North-West England, in addition, the snowball method was used to find participants on the Forum of Practising Nurses. The purpose was to provide maximum variety and colouring. The article con be found of the following link: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2835666/pdf/1471-2296-11-7.pdf

Snowball sampling: It can be applied if it is difficult to define the members of the population, e.g. the homeless, illegal immigrants, women who planned to give birth at home. The researcher gathers data from people belonging to the chosed population, then permission is sought regarding the accessibility of other people whom they know and who belong to that particular population. The word "snowball" refers to gradual accummulation, the people who have been accessed suggest new people. It is primarily used with the purpose of exploration.

E.g. The purpose of the research is to examine the change in the character of nursing work in provincial hospitals and hospitals of small communities. All those different registered and practising nurses, as well as senior nurses, who worked in the 7 hospitals involved in the study, were entitled to take part in the examinaton. First the head official of nursing was approached by phone or in an e-mail in each hospital. They were asked to designate two other nurses who would be willing to take part in the examination. In the end 21 interviews were recorded. The original article can be found at the following link: http://www.rrh.org.au/articles/subviewnew.asp?ArticleID=1089

Quota sampling: Its starting point is a table (matrix) describing the traits of the target population. The proportions existing in the population, the categories according to males, females, age, education etc. must be known. The random selection of elements into the individual categories (cells) is not ensured. It can be a problem that it is difficult to obtain current, appropriate information on all the cells, as well as distortions can appear in choosing the sample elements in a given cell.

Roe and May [45] examined the effect of incontinence on the sexual life of the individual. Subjects were selected using quota sampling, one of the groups (14 people) can be regarded successful, for the second group (12 people) the intervention provided by advising, community nurses was unsuccessful. The abstract of the original article can be found at the following link: http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2648.1999.01126.x/abstract;jsessionid=FD4FC8BB1EC67A68D9FE46BC65F61295.d01t01

Probability sample

Each member of the population has an equal chance of being selected, the sample taken in this way represents the population duely, so the conclusions drawn can be considered better grounded.

Simple random sample: The subjects of the sample are randomly chosen from the available population list. It is important that the list (called sampling frame) is complete, which ensures that each subject has an equal chance of being selected. Its method can be to give numbers to its elements, then a randomized number chart is used, or a computer is used to select the elements of the sample.

E.g. The effect of education and awareness on life quality of women in postmenopause was examined. An arbitrary and accidental starting point was chosen in a random table. Those who had this number were selected in the study group, then they continued in the set of numbers, and if the number was less then 62, then the owner of the number was selected in the control group. This process was carried on until the 31 participants of the two goups were selected. The original article can be found at the following link: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2888337/?tool=pubmed

Systematic random sample: Every *k*'th item of the complete list is selected systematically. For example if the study population consists of 1000 (N) persons, and a sample of 200 (n) subjects is intended to be taken, every 5th element is chosen in the sample: k=N/n. The first item is chosen randomly.

It is useful to know the nature of the list since if the elements of the list have a certain arrangement, it is not useful to choose this method. It is called periodic arrangement.

E.g.: The study [43] carried out in Melbourne was aimed at examining the health condition and the occurrence of tuberculosis of a representative sample of homeless people who used different levels of accommodation, then comparing the findings with the condition of homeless people who did not use accommodation (lived in streets and parks). The sample frame was 13482 beds, from which every 34th was selected in a systematic way, thus a sample of 396 was created. The homeless people who lived in the streets were reached using the convenience/simple non-probability method (100 persons). The abstract of the original article can be found at the following link: http://www.ncbi.nlm.nih.gov/pubmed?term=A%20methodology%20for%20sampling%20and%20accessing%20homeless%20individuals%20in%20Melbourne

Stratified random sample: In the course of stratification, you divide the population into homogenous subgroups, and choose an adequate number of subjects from each randomly. Stratified sampling results in a higher degree of representativeness, by which sampling error can be reduced. Sampling error can be reduced by two factors: sample size (the larger the sample, the smaller the sampling error), and the homogeneity of the population. It can be applied if you know the proportion of the individual strata to the population, however the choice of these variables mostly depends on what variables are available. A further version of this method is proportionate stratified random sampling when the samples from each stratum are taken in accordance with the proportions of the population. Subjects from the formed groups are chosen with a systematic method. Subgroups may be formed for example according to gender, age, severity of disease, length of illness.

Eg.: Matthews et.al conduct an observational, cross-sectional survey of the oral health status of adults ≥45 years of age in sural and urban long-termcase facilites in Nova Scotia, Canada. The stratified random sample was applied. The original article can be found of the following link: http://www.jcda.ca/article/c3 [27]

Cluster random sample: In this case not certain subjects but groups are selected randomly. It can be applied well if the complete enumeration, making a list of the elements of the population is impossible or difficult to implement. For example the choice from the country's schools is random but within the school every student is asked. However, it is also necessary to know whether the individual schools have a distorting effect or not, for example alternative teaching methods, students with special needs etc.

E.g. Sackley et.al (2009) clinical efficiency of physiotherapy and occupational therapy (on mobility and activity provision) was studied among residents of nursing homes whose mobility is limited and need the help of their carers in their everyday life. The cluster random sample was applied. The original article can be found at the following link: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2736373/pdf/bmj.b3123.pdf

Multi-stage sampling: Similarly to cluster random sample, first groups are selected, then a list of the subjects in the group is made, and the sample is chosen randomly from the list. This examination form is often used in the course of epidemiological and multicentral examinations. It is different from cluster random sampling because the classes are selected randomly in the shools which are selected randomly, and the students within the class are selected randomly. This method reduces distortions, but at the same time it increases the number of schools to be selected when selecting the same-sized sample.

E.g. Yichong et.al (2011) applied multi-stage sampling to explore chronic illnesses and risk factors. The original article can be found at: http://www.ncbi.nlm.nih.gov/pubmed/21771141

Criteria of inclusion and exclusion

Before identifying the sample frame you have to think over the characteristics which, through the subjects included, can distort findings. Inclusion: for example if eating habits of pregnant women are examined it is not good to include those who suffer from a chronic disease (e.g. diabetes, renal disease etc.) as they are very likely to follow a special diet. You should think it over whether it is justified to include young people starting out on a career and still living with their parents in an examination of problems of unemployed people. Exclusion criteria also ensure homogeneity of the sample.

An example of this, suggested for review of determination of inclusion and exclusion criteria, is the research entitled "Implementation of a stroke alert protocol in the emergency department: a pilot study". The original article can be found at: http://jaoa.org/content/111/1/21.long

Aspects necessary for determination of sample size

In order to determine the size of sample it may be helpful to use partly professional considerations, partly mathematical and statistical methods. If the sample is 1-2, 5-10, mainly qualitative examinations are used, and quantitative analysis has only a limited role. In general it is not useful to carry out statistical analysis on a sample of less than 30-40 subjects.

Factors affecting sample size:

- ***Planned use, importance of findings obtained, requested precision of findings.*** If, for example, it is intended to establish a decision which will have its effect for many years and will concern many people, a larger sample is needed.
- ***How powerful the effects of the examined variables are.*** If the intervention applied is a quite powerful variable whose effect is significant, the difference will be significant too. The less marked effect is supposed to have of a particular variable, the larger the sample that is required..
- ***To what degree the effect of the examined variable is similar on the individual subjects.*** The more strata influencing the effect are present in the population, the larger the sample that is needed in order to eliminate a potential "distorting" effect of the persons included in the sample. Heterogeneity of the population increases the size of the necessary sample.
- ***Number of variables intended to be examined,*** the more of them there are, the larger the sample that is needed.
- ***Special features of the method intended to be used.*** For example with on-line surveys, it is not a problem to increase the number of elements. In the case of observation, it is necessary to pay attention to a subject for up to several hours, which is difficult to implement with a high number of elements.
- It is necessary to think over the procedure of data collection and processing, ***its time and cost requirements*** as well.

Data collection research instruments

According to the presence of impact, exposition in the research, experimental (interventional) and non-experimental (intervention-free) examinations are differentiated. In experimental research, the researcher manipulates the changes in

phenomena, this method is described below. In health science research it may mean clinical, territorial and population level experiments.

Non-experimental examinations in the field of nursing can be carried out using different research instruments, from which, due to limitations to size, the methods of experiment, survey, observation and interview are described here.

Experiment

In experimental research, the researcher studies the cause-effect relationships between variables systematically and rigorously, and takes steps in order to ensure the achieved results (the effect) could only be attributed to the intervention. The most important advantage of experiments is that they can provide evidence for everyday care and practice. In healthcare experiments are generally called clinical trials.

The aim of explanatory examination is to understand how and why the intervention works, that is, it is directed at acquiring scientific knowledge. ***Practical experimental research*** examines the effectiveness of interventions in real research situations. In this case, the intervention is tailored to the condition of the patient, whereas in explanatory research, patients are selected for the intervention.

Real experimental research

Intervention, control and random sampling are jointly applied ***in a real experiment.*** A controlled randomized trial (CRT) is capable of detecting a causal relationship, in which there is no difference in the treated group and the control group in terms of applied treatment, or intervention, therefore the difference appearing in the target variable can be attributed to the intervention (or to chance).

Intervention

There is no experiment without intervention, the researcher has to do something in order to achieve an effect. In healthcare research the term *"treatment"* is often used instead of the word intervention. In the course of experiments hypotheses and theories are tested.

E.g. Robbins et.al [44] evaluated the efficiency of information booklets and home visits in teaching about children's diseases. The aim of the research was to evaluate the effects of the intervention on

- the use of healthcare service;
- the self-confidence of parents and their knowledge about children's diseases;
- the parents' intentions to treat the children's symptoms at home;
- the parents' intentions with regard to seeking specialist advice.

Control

In order to prove that the only variable is responsible for the result, the researcher has to control certain external variables. Those variables may belong here which themselves or together with other variables can also bring about the result. E.g. if the researcher wants to test the efficiency of consulting in the treatment of depression a conclusion may be drawn, that the patients' condition improved as a result of consultations. However, the researcher cannot be certain of this, as it may happen that their condition would have improved anyway "over time", or other factors e.g. medication – helped. In order to establish the real value of consultation sessions, setting up another group is suggested, in which patients receive the usual treatment, but they do not receive consultation. The group which receives the new intervention is the experimental group, and the group which is used for comparison is the control group. In addition to groups set up in this way, further possibilities to create control groups are going to be described.

Intersubject design or parallel groups: In the case of parallel groups, conclusions are drawn in the experiment after comparing two groups (treated/control) or more groups. This is the most frequent design in the case of randomised control trials (RCT). As previously mentioned, the study of Robbins et.al (2003) which explored the education of parents about children's diseases, parents who received visits and booklets were included in the experimental group, parents who received usual service were included in the control group. Intersubject design may as well have more than two groups. The number of groups depends on the aim of the experiment.

Within-subject or crossover design: Crossover arrangements also belong to repeated measurements. It is possible that in the case of two treatments being compared, the effect is different. However, it may show such a big spread among the subjects in the experiment, that working with two parallel groups the difference between the treatments will not be demonstrable. In this case the differences between treatments can be demonstrated by applying them on the same subject one after the other. In case of chronic illnesses should be used such as(asthma, high blood pressure, diabetes, rheumatism) when healing is not only an alleviation of pain but an improvement of state can be expected due to the treatment. Other examples include, if the researcher wants to find out if aromatherapy helps patients with a sleeping problem to sleep, they may select a group of 20, out of which 10 patients receive aromatherapy, the other 10 patients receive the usual sedatives during a time period of 3 weeks. Then the researcher exchanges the treatments, the first group will be given the usual sedatives, the second will be given aromatherapy. By comparing each patient's results they can assess the effects of the new intervention.

Pearson and Hutton [37] compared the efficiency of the use of foam swabs and toothbrushes, some subjects used foam swabs, the others a toothbrush for a week, and the treatment was exchanged the second week. By this it was ensured that the effect, due to the order of treatments, could be assessed. By changing the sample the difference between the groups was minimized, "each person functions as control for himself". http://www.ncbi.nlm.nih.gov/pubmed/12175357

The main problem with the crossover arrangement is the *continuing effect* which happens when the effect of the first treatment carries on during the second treatment period. Researchers must pay special attention to this problem, and leave a period between the two interventions.

In some cases it is also possible that the same patient receives two interventions at the same time. This may make the control and experimental group unnecessary, furthermore it ensures that the effect of extraneous variables is reduced to the minimum, as the same patient is involved and almost the same deviance. Its disadvantage is that this kind of experiment can only be applied in very few cases.

Single-case design: Experiments in which people are involved during healthcare provision are problematic in terms of generating a sample including a large number of elements. Even if it is possible, it is difficult to create groups according to the relevant variables. The problem is even more serious when subjects, due to different reasons, drop out of the experiment. These logistical problems are minimized by single-case design as only one participant is included at a time (obviously, if the only participant drops out, the experiment is finished). In its simplest form, a pretest is followed by a posttest after the intervention. This kind of design is also known as AB design, where A is the pretest, B is the posttest, and the intervention is carried out in between the two.

It is suggested that more than one intervention should be done, repeated several times, possibly on different days, and if possible under different circumstances, because of the control of impacts. This design is useful in such cases when little is known about the effectiveness of the intervention, and it is coupled with the difficulty brought about by the large-sized traditional experiment. The biggest limitation of the individual case design is the fact that the observations cannot be generalized on a similar population since these are individual cases.

Solomon four group design: The aim of creating several groups is often not having more interventions but a better control of influencing extraneous factors. The purpose of a pretest and a posttest is usually to find out whether the independent variable (intervention) caused a change in the dependent variable (result). It may occur though that the test done before the intervention itself influences the outcome. In the case of a depressed patient for example, there

Table 1 Overview of the Solomon-type experimental design

Group	Pretest	Intervention	Posttest
Experimental group1	+	+	+
Control group 1	+	Usual treatment	+
Experimental group2	–	+	+
Control group 2	–	Usual treatment	+

are patients who are more aware of their condition, and as a consequence, they motivate themselves to perform better. In order to avoid this, the Solomon four group construction can be applied (Table 1), which consists of four groups, two experimental groups and two control groups. The pretest and the posttest are carried out on a control and an experimental group, and a posttest only on another control and experimental group. This type of design eliminates the effect of a pretest on the outcome. If you compare the results of the groups, you may discover if there has been such an effect.

E.g. Bakotic et. al [3] the effect of information booklets on healthy sleeping among adolescents was examined, in which secondary school students of 15-18 were included in the two experimental and two control groups. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2681062/pdf/CroatMedJ_50_0174.pdf

Factorial design: In experiments, the effect of the independent and dependent variables are usually examined. For example if fluid and fibre intake affect constipation, then it is examined in both the experimental and the control group. Probably several factors interact in real life which influence the outcome. In this case the hypothesis may be that exercise, fluid intake and fibre intake or their combination affect constipation. In factorial design, the effect of two or more independent variables is tested upon one or more dependent variables within the same research. The phrase "factor" refers to "variables" in this design. This form is suitable for studying the interactions between variables, and it adds a usage value which is given by the combination of interventions.

Randomization

Some forms of random sampling have already been described in earlier chapters, which are going to be complemented now by some further possibilities that can be used in experiments. In experiments randomization means that subjects have an equal chance of inclusion in the experimental and control groups. In the case of smaller numbers, a box can be used from which slips of paper are drawn and this will decide who is included in which group, if there

are large numbers a computer may be used for the draw. However, it is common that at admission every subject receives a non-transparent envelope with a letter A or a letter B inside. Neither the researcher nor the participant knows the content of the envelope. This is called hidden distribution.

Matched subjects design: It is possible through this method that subjects are included in two groups according to the relevant characteristics. If the researcher claims the distribution of the following characteristics – middle class women between 48 and 50 with a new diagnosis of breast cancer – in the experimental and the control groups, they will seek two subjects who meet the criteria, and who can be included in each group. This activity continues until the required number of subjects is reached. The adequately matching selection technique is usually necessary when the researcher knows in advance what the control variables are. The potential number of variables is endless, that is why it may never be certain whether all the essential characteristics of the participants are the same. Furthermore, it takes a long time to find all the matched subjects for the necessary number of elements.

Randomized block design: It is useful to apply the block design when a factor exerts an unwanted effect on the target variable. This can be controlled if, instead of complete randomization, this factor is used for stratification (the strata are the blocks), in each stratum each treatment is divided, and randomization is done within the strata. Through this, the average values of individual treatments are affected by the factor to the same degree. For example, if in an experiment 3 treatments are compared, the number of subjects is 5 per treatment, and due to technical reasons all the measurements have to be taken in one day. It can be an influencing factor that the value of the target variable may vary according to the periods of the day. Furthermore the procedure is time consuming, the measurements last from morning till night. In this case the block design can be applied, in which e.g. 5 blocks can be created (early morning, morning, midday, afternoon, evening), three measurements by each block (1 of each treatment) randomizing the treatments within the block.

Zelen design: In a traditional RCT, participants who meet the criteria are selected through randomization after they have given consent to the treatment. Sometimes this may lead to withdrawal of consent, because they are not yet divided into groups (experimental and control) as the subjects have hoped for. Some of them are so disappointed that they do not fully meet the protocol, and this may affect how they respond to treatments allocated to them. The Zelen design offers an alternative approach to this, which is randomization of all participants (who meet the criteria of admission) before their consent is asked for. In a traditional RCT participants are informed of the details when gaining consent.

Quasi experimental research

Sometimes it happens, due to several causes – ethical and/or practical –, that it is not possible to carry out the real experimental research in nursing or in other healthcare areas. For example if the nurse introduces a new nursing model in the department, it is not feasible that patients are included in two groups in the same department or in different departments either, due to clinical, ethical and organizational considerations. Possibly the new model introduced in the department can be compared with an identical department (where another model is applied – or even the same) in the same hospital. Therefore in the case of quasi experiments, there is ***intervention but either the control group or random sampling is missing.*** In this case the researcher cannot control the extraneous variables adequately, due to the uncertainty that the new intervention is really responsible for the measured change, but the verification of the close connection is possible. There are several possible versions of quasi experimental research:

- Intervention is carried out, then the outcomes are measured. For example the relaxation technique is applied with a group of patients if the researcher wants to know whether the level of anxiety lessens or not. This is the weakest form of experiment as there is no pretest, *just a posttest.*
- The researcher measures the level of anxiety *before and after* the introduction of the relaxation technique. This shows the change (if there is any) with greater reliability, though it is still difficult to state if the relaxation treatment is the cause, because several other factors can cause the change.
- The level of anxiety is measured on an experimental and a comparative group before and after the intervention. The result is even more reliable. This design is called *non-equivalent group design*. The subjects in both groups may be similar in many respects, but the researcher does not have enough control in selecting them in order to ensure equivalence.
- *Interrupted time series* (ITS) form includes an experimental group and the series of measurements before and after the intervention. In this form four measurements are carried out (01-04) before the intervention (X), then four posttests (05-08) after the intervention. It is represented as: 01 02 03 04 X 05 06 07 08.

Questionnaires

The questionnaire examination is the most frequently used primary research technique, it is suitable for descriptive, explanatory and exploring purposes. It is also a frequently used method in the field of nursing research, especially in examina-

tions of such concepts as empathy, burn-out, social support, pain, coping, hope, stress and life quality. In addition, information can be gathered with regard to attitudes, knowledge, beliefs, opinions, expectations and experiences of the client or the carers. The advantage of this method, is that it can be implemented relatively easily, mostly it does not burden the respondents, it is adequately compiled, and the filled-in questionnaires may provide relevant information for the researcher on the above topics. In certain research topics, it is the only possibility that can be applied. Its disadvantage is subjectivity of both the compiler of the questionnaire and respondents, in some cases the lack of sincerity. The purpose of the actual compilation of the questionnaire is to ask essential questions and obtain relevant information. The most important aspects of compiling a questionnaire, the different types of questions, and general rules of their use are reviewed below. What is written down here is not compulsory rules, but considering them will make you get closer to achieving your objectives.

The questionnaire survey has four differing forms, the self-completion form when the respondent completes it in, the questioner asks the questions and records the answers, by phone and by e-mail which is becoming more a common data collection. A special form of self-completion is the group self-completion, where there is a possibility during completion for the respondents to ask an interviewer who is present.

General rules of compiling the questionnaire

In general, the characteristics of the target population should be taken into account, such as their age, social status, knowledge, qualifications for example. These factors may significantly affect the way the questions of the questionnaire are worded and subsequently, the compilation of the questionnaire. Apart from the characteristics above, further aspects that are worth considering are the following:

- ***Wording should be comprehensible.*** The questions of the questionnaire have to be clear and unambiguous. It may happen if the researcher is deeply involved in the particular topic, complicated questions may seem simple, and the other way round, the question will not be exact enough as a result of studying it superficially. Do not use complex sentences, avoid using foreign words and overpolite sentences.
- ***Do not ask two questions at the same time.*** If you see the word 'and' in a question or statement, always check and make sure you are not going to ask a "double-barrelled" question.
- ***The respondent should be competent at the question.*** You should continuously pay attention to whether respondents are able to answer the question reliably, whether they have enough information to answer it. The topic should be adequately covered by the respondents, the question should not need an answer which cannot be given by the respondent at all, or not reliably.
- ***The respondent should be willing to answer.*** Many times you want to get information about things which people are not willing to share.
- ***You should ask relevant questions.*** The questions within the questionnaire should be about issues that are essential or topical for most respondents, which are not remote for them.
- ***Use short questions if possible.*** The respondent does not necessarily start studying the question if they do not understand it. It should be possible to read the question quickly, understand the main point, answer it without any difficulty, answer it quickly, and mark the answer quickly.
- ***Avoid negative sentences.*** Many respondents skip the word 'no' and answer accordingly.
- ***Avoid using leading questions and phrases.*** An answer to a question greatly depends on the way the question is put. The question which makes the respondent answer in a certain way is called leading question ("You agree with ….., don't you?)
- ***Make it possible to refuse to answer a question.*** "I have no opinion", "I do not know", "I would not like to answer" can be used. If you do not make it possible to refuse to answer, the respondent is forced to give a false answer.
- ***The time of asking*** may be important. For example university students are more likely to answer and can be reached more easily during the semester; the patient satisfaction questionnaire is filled in at about the time of leaving the hospital, as at that time the severity of problems that may have arisen may be different from what the patient experienced during hospitalization.

Question types applicable in questionnaires

The most frequently applied division according to the type of questions are closed-ended, open ended and semi-open. According to possible responses, there are one- or more-responses, according to the direction of the question indirect or direct questions are differentiated, which are described below.

Where ***closed-ended questions are used,*** the choice has to be made from the responses given by the researcher in advance. Its advantages are: the writing skills of respondents are not important, the number of answers received is greater, it is a simpler task for the respondents, more questions can be asked and it is easier to process the answers. The responses gained through them are more uniform, and it is easier to process them. In the case of closed-ended questions there are two fundamental requirements to be observed. One is ***the principle of completeness,*** according to which, every answer has to be listed, that is all the possible answers should be covered by the answer options. This is often difficult to do, that is why at the end of closed-ended questions there is the option "other". The other is ***the principle of exclusivity,*** which means there must not be an overlap between two options. E.g. in case of age, a 30-year-old person can mark two if the options are 18-30 and 30-45.

- The closed-ended questions described above represent the category of ***selective (or multiple choice) questions*** where the number of response options is high, a minimum of three.
- In case of ***dichotomous (yes or no) questions*** there are only two options. (E.g. Have you ever used the internet? Yes/No)
- In this case a so-called ***mediate position*** (e.g. "I have no opinion" and "has not answered") can be included. Furthermore, additonal help can be given on meeting certain conditions. (E.g. "Are you going to vote? Yes – on condition that ...)

Respondents answer an ***open-ended question*** in their own words. It is very informative, it offers greater freedom to form opinions. Its advantages are that it is easy to compile, there are no leading answers, responses received can help to word closed-ended questions. Its disadvantages are that it requires more time and effort from the respondents, it is not possible to ask a large number of questions, high-level writing skill of respondents is needed, processing is more complicated and more time-consuming. Generalization of results can be doubtful due to the possible high number of wrong answers given to open-ended questions. Some situations are listed below when it is worth using open-ended questions:

- at the stage of preparation of questionnaires (e.g. what options have to be listed in closed-ended questions);
- opener question, the opinion of the respondent about the topic in general;
- you do not want to influence respondents by the offered options;
- you are not likely to be able to meet the requirement of completeness and exclusivity, that is we do not have enough information on the possible responses;
- we are interested in the opinions, thoughts of the respondents;
- how the respondents word their opinion in connection with a particular question;
- follow-up questions e.g. "could you give an example?";
- reason-why questions;
- argumentative questions (arguments are expected apart from reason);
- checking knowledge ("what do you remember ... ?");
- asking for suggestions;
- for complementing closed-ended questions e.g. the option "other", or "justify" the answer you marked, or write an example as a complement.

A transition between the previously mentioned two types of questions are semi-closed or semi-open questions, which may help if the principle of completeness cannot be fully met. You want to ensure the possibility of other options in the responses.

With ***one-response questions,*** only one of the offered options can be chosen. Accordingly, if the respondent marks several responses, this question cannot be evaluated. It may happen no matter how thorough you are, that you have not given adequate options.

With ***multiple-choice questions,*** more than one of the options can be marked. A special case of multiple-choice questions is a question which allows for rank ordering. Respondents have to place in order of rank options, offered, according to some aspect.

The possibility of giving several responses can be reduced (limited) so that respondents can only mark two or three most typical characteristics. For example, information about a particular thing can be obtained from various sources, but really valuable and useful information was provided by one or two persons or other sources.

The aim of ***indirect questions*** are to make it possible to draw inferences about an opinion, attitude, interest or knowledge through the categories which have been marked.

You may ask about income directly as well, but respondents might be reluctant to answer it sincerely. It is a more expedient tool, also used in sociological research, to ask whether they have certain possessions, holidays in the home country and abroad, or whether it is a problem to buy food or pay the bills.

Direct questions are used to ask about the required information, for example qualifications or marital status. They need to be applied thoughtfully when exploring areas that can touch on sensitive issues, where answering can be unpleasant, which concern intimate issues, connected to death or other negative feelings.

Indices and scales

Concept and use of the indices

In quantitative research, there may be variables which cannot or can only approximately be examined using a single indicator. In such a case a comprehensive, authentic indicator incorporating several data can be applied, which attaches a single value to the given variable. It is recommended to use them in exploring attitudes, opinions and intentions.

The creation of indices makes it possible to measure complicated phenomena. In their application the score values belonging to certain attributes and marked by the respondent are added up, and this is called ***index value.*** A recommended example is the SF (Short-form) 36 life-quality assessment questionnaire. Ready-made, standard questionnaires are available to assess several areas (life quality, prejudice, satisfaction, attitude). They are worth looking at instead of compiling your own.

Consider the following when formulating items:

- the items should describe the phenomenon to be examined properly;
- the individual items should express approximately the same intensity.

Concept and use of scales

Whereas indices explore complicated phenomena, scales are able to show the inner structure of the measured phenomenon. Assessment scales may signal the presence or lack of something. The intensity of judgement or opinion is signalled by graphic scales (generally they consist of a simple line), judgement about certain things are expressed in numerical values on numerical scales. There are several forms of scales, the ones that are most frequently used are described here.

The ***semantic differential scale*** measures the intensity of the dimensions of phenomena and processes using a graphic scale between two contrasting statements. At the end of the scales there are opposing adjectives, such pairs as good-bad, friendly-unfriendly, satisfied-dissatisfied. The continuity between the two extremes are usually represented by a line consisting of seven stages. Respondents mark their attitude to the phenomenon or process using a clearly visible mark on the line.

The Likert scale can be used to measure states and opinions. Respondents have to mark the degree of their agreement in connection with a statement. (This scale was developed to measure attitudes by Likert in 1932.) Respondents have to choose something between the ends of the scale "strongly agree" and "do not agree at all", or "strongly approve" and "do not approve at all". There are always five grades to this scale, and it is comprised of several statements which reflect various positions. The Likert scale is well applicable for screening by using reversal items.

A common form of scale is the ***Bogardus scale measuring social distance,*** which is used to measure the social distance between social groups, values and people. Respondents have to answer the question of what interaction-communication community they would enter into with a person of different nationality, ethnicity, skin colour etc. Listed options are family ties, the same neighbourhood, the same workplace, tourist or complete refusal. Differences in intensity can be quite obviously measured through this and in a way that can be assessed properly.

With ***visual analogue scales (VAS),*** records appear on a line between two points ensuring a greater freedom for the respondent to mark the most typical position. The line can be horizontal or vertical and of different length, but the most common is 10 cm. The vertical form is preferred because the contrasting pairs of more-less, the best-the worst appear on it in a more direct form. It can be used for measuring different forms of e.g. laboured breathing, physical activity, fatigue or pain.

E.g. Aghabati et.al. [1] examined the effect of therapeutic touch on pain and fatigue of cancer patients undergoing chemotherapy. They used VAS to measure pain with a 10-cm line labelled 'no pain' at one end and 'the pain is as much as I can bear' at the other end denoting options between them. Fatigue was measured by the Rhoten Fatigue Scale (RFS) which ensures self-rating of the 11 points with 'No fatigue' at one end and 'The fatigue is as much as I can bear' at the other end. The whole article can be reached on the following page: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2887328/pdf/nen006.pdf

Compilation of questionnaires

Instructions described previously provide information for the best possible formulation of research objectives and hypotheses. However, apart from content aspects, reaching your aim can also be influenced by the layout and structure of the questionnaire, by the order of questions, especially with self-completion forms.

Instructions for completing the questionnaire

In case of a self-completion form, the questionnaire has to be introduced by instructions about how to complete it:

1. introduction (name and institution of researcher).
2. purpose of research (what is going to be asked, what the answers will be used for, the respondent may possibly be motivated by being informed how important it is to have sincere and complete answers in this process, and their interest may be aroused).
3. instructions on how to complete the questionnaire (e.g. "mark the answer by writing an x in the box", or "circle it", how long the answer to an open question should be, etc.).
4. encouraged to answer every question ("please answer every question, if you are uncertain, mark the one that you think is closest to being true").
5. data protection and anonymity (assure the respondent that the obtained information will be handled confidentially, it will only be used for the research).
6. thank them for their participation.

You should give clear instructions and place explanatory comments if necessary. If the questionnaire is divided into content chapters, there should be a brief introduction about the chapter at the beginning of each chapter. If instructions differ from the generally used instructions of the questionnaire it should definitely be noted, e.g. if after several one-option closed questions there is a question to which several possible options belong.

Layout of questionnaires

If the layout of a questionnaire is wrong, questions may be forgotten, therefore it is essential for the questionnaire to be organized and clearly arranged. Special attention must be paid to font size and clear arrangement if children or elderly people are asked.

Conditional questions

The questions in which the answer depends on an answer given to a previous question are called conditional questions. Their appropriate use makes the work of the respondent easier as he does not have to deal with questions that do not concern them. It is important for the conditional question to be separated from the other questions. It is useful to write separate instructions on top of pages where there are only conditional questions.

Table (matrix) questions

They are useful in their applicaiton, if you want to ask several questions to which the possible answers are the same. For example when Likert scales are used.

The order of questions

A particular question may influence how the respondent answers the following question. For example if the subject recalls a pleasant experience with colleagues, in the next question they may evaluate the relationship with them more positively. Sensitive questions should not be asked at the beginning of the questionnaire, start with information or sources of information.

Pay attention to the logical sequence of the questionnaire, according to which two kinds of question order are differentiated: the psychological and the logical order.

The psychological order takes into account what respondents feel about the contents. Respondents always have to be introduced to the new question type to avoid participants reluctiance in answering the question.

The logical order is based on the logic of the content. Where the order that the respondents are led, gradually leads towards the issues participants are interested in.

There is a somewhat different order with self-completion form and in the case of its completion by an interviewer. In the case of the self-completion format, a few warm-up questions that can easily be answered should be followed by the main questions, and the demographic questions should come at the end of the questionnaire. If an interviewer is present, they should get the respondent who is willing to participate, so they start with demographic data, and when the relationship is established participants can move on to the more sensitive issues.

If the questions are about past, present or future states, they should be arranged in the same structure so that they could be compared clearly during analysis.

Pilot survey

Even if the compilation of a questionnaire is most accurate, there may be errors, that is why it is necessary to do a pilot survey. Basically there are three types of mistakes that can be differentiated:

- formal mistakes: typing, spelling and layout errors;
- content errors: certain questions cannot be interpreted, they are unnecessary, or the response options may be missing;
- logical errors: no coherent numbering of items, no relevant response options.

Respondents may be asked to give their opinions, comments in connection with the questions. It is also useful to measure the time if we know that there is limited time available (e.g. a school lesson). It might also be useful if you can tell the respondents approximately how long it will take to fill in the questionnaire.

Observation

In nursing, observation is possibly the most important method of data collection, the process of nursing requires precise and accurate observation from measurement to assessment.

"Observation is regarded as a scientific method in the course of which the researcher, who has a good grounding in the field and is knowledgeable, using deliberate methods, observes a fact or event that is independent of them and can be refied in order to achieve the preliminarily set objective." Information can be gathered during observation, or can be recorded after the events.

Observation is particularly suitable for studying psychomotor activity and other non-verbal activities, for studying the behaviour of patients and healthcare specialists in certain interactions and communications. Observations themselves tell a lot about human behaviour, it enhances understanding if they are used in combination with other methods such as interviews or document analysis. The advantage of observation is that it examines the phenomenon in its natural environment, if the events are recorded at the time of occurring, – e.g. video recording, taking notes –, the distorting effect of memory can be eliminated. The disadvantages are that it is time-consuming, it is not certain that the observed phenomenon or event happens spontaneously in the presence of the researcher, the disturbing presence of the observer, it may result in subjective statements, it cannot be applied for lengthy events or events that run parallel, in most cases it necessitates the use of other methods as well.

Some nursing research in which observations were applied: work behaviour of nursing managers [13], nurse-patient interactions in connection with pain assessment [30], patient education [5], nursing of patients in the intensive care unit [53], examination of the interactions between carers and demented persons whose behaviour is aggressive [50].

Types of observations

The two main types of observations are structured and unstructured observation.

In the course of ***structured observation*** the researcher defines the object, purpose and methods of observation by which they do the activity in advance. For example if you want to examine the nurse's activity, the researcher has to break down the activity into several units, categories. In order to carry it out, it is necessary to set up a list which is similar to a questionnaire. Observation categories can be described as "molar" and as "molecular" units. "Molar" units are comprehensive or abstract, thus the task of the observer is more difficult as they are not defined by the category in due detail for better recognition. "Molecular" categories on the other hand are more detailed and more precise, which makes it possible for data recording to be more exact.

Unstructered observation is applied when you know little about the examined phenomenon, knowledge is deficient or lacks due validity. The researcher observes the phenomena without determining its details. Based on data obtained in this way categories can be set up for a structured observation at a later time.
For example Samarel [48] investigated the interactions of hospice nurses with terminally ill patients applying unstructured observation. He found that the interaction of observed nurses was different from nursing interactions with dying patients described in the literature. In this case data gained through the comments of unstructured observation mean a challenge to current knowledge. http://www.ncbi.nlm.nih.gov/pubmed/2613451

Forms of observation according to the observer's role

In the course of observation, three basic types of situations can be differentiated according to the role of the observer:

The observer does not participate in the situation, their presence does not disturb events (it is rather difficult to do it in practice in healthcare institutions, essentially the observer examines from a perspective in which they do not disturb events). It is essential that during observation people cannot be picked out of the environment or relationship system in which they exist. That is, it is affected by the environment outside the situation e.g. family members, the relationship between the subject and the situation e.g. the site.

The observer is present at the observed event or situation. Its disadvantage is that their presence fundamentally influences the situation, it may modify it. In addition to that, the presence of the observer may modify the relationships mentioned before as well.

The observer participates in the situation. In this case the observer – even if not necessarily consciously – may influence the observed situation with their behaviour or communication. Information and events are recorded afterwards, which may also result in distortion.

Interviews

Interviews are an essential method of data collection and are needed for decisions and activities concerning suitable provision.

Research interviews can be carried out face-to-face (complemented with a video recording), – mainly this form is presented in this chapter –, occasionally on the internet or by phone.

A qualitative interview is of good use in the initial phase of the research where it helps to identify the problems, formulate hypotheses, evaluate possible solutions and prepare further examinations. It is mostly informal, interactive, flexible and adaptive but planned in advance. It is not suitable for collecting objective numerical data, it is a labourious task to analyse the content of the spoken text. In addition, it can be used at the final stage of the research in the evaluation of the results. In contrast, ***the quantitative interview*** is close to the questionnaire method as its purpose is to collect data suitable for statistical evaluation, to support a hypothesis.It gives objective, numerical data, it is connected to formal, preset questions, and it is based on a larger sample.

Types of interviews

Unstructured interview

What makes it different from an ordinary conversation is the fact that the interviewer is aware of the interview situation, they have a conscious conversation, continuously keeping in mind the purpose of the research. This interview is primarily used for getting information, exploring relationships. Several interviews might be carried out with one or more persons during a long time period. Above all it must be kept in view that the interview is not anonymous, so the direct presence of the interviewer may influence the answers received as well as the willingness of the respondents to co-operate. It is difficult to categorize and code the obtained information.

Structured interview

A structured interview is like a structured questionnaire, and it is often used to collect data in connection with attitudes, beliefs, opinions, as well as practice and provision. The researcher asks the preformulated questions similar to questionnaires. The order of questions is set, though they may occasionally vary. The interviewer asks the questions word by word and requires a compulsory answer, this ensures that later the data of individual interviewees can be compared. Adventages a structured interview:

- The presence of the researcher may be useful, e.g. if the question measures knowledge, and if he wants to prevent the respondent from consulting someone before answering;
- A face-to-face interview increases a willingness to answer;
- The researcher can provide help and support if needed;
- In case of deficient or inadequate answers the non-verbal behaviour may show their confusion, or if they did not understand certain questions, the researcher can provide help immediately;
- The researcher may help those, too, who have problems with reading and/or writing skills.

According to Waltz (1991) structured interviews are mostly used when you want to obtain the same information from the respondents, and you want to compare the answers of respondents who have a relatively homogenous background and experience in case of a large or geographically divided sample.

Semi-structured interviews

A semi-structured interview ensures the possibility of modifying words – but not in terms of question as not every word means the same for every respondent, and not every respondent uses the same vocabulary. A semi-structured interview has quantitative and qualitative elements.

Focus group

One or two researchers talk to several interviewees at the same time based on a determined interview plan. It is typically half-way through between the interview and the observation. It can be used to answer research questions, to define concepts, problems or to prepare questionnaires.

It is typically used together with other methods. Its advantages are that interactions can be observed, several people generate the conversation, information is obtained that cannot be explored in a single-person interview. Participants are concerned with the topic, they co-operate, they can understand the questions, and they are willing to explicate their opinions.

Recommendations for the interview process

Before the interview

When a participant is interviewed in their own home, the person may feel an obligation to help the healthcare specialist either because they are grateful for the provision already received or because they may need it in the future. Special care must be taken preparing and conducting the interview with vulnerable people e.g. bereaved relatives, individuals suffering wiht depression, those who are suicidal, or individuals who have undergone either a Termination of Pregnancy or suffered a miscarriage. Even if they have recovered, or they did not experience a tragedy, their living conditions may make them vulnerable.

During the interview

- introduce yourself, prove your identity and your participation in the research if needed;
- sum up the purpose of the research in the beginning;
- assure the interviewee about anonymity and confidential handling of what they are going to say;
- offer to informthe participant about the result of the research when it ends, tell them what benefit they may have from the conversation;
- create a pleasant atmosphere by commenting positively on the environment;
- create a relation of confidentiality, act in a non-judgemental manner so as not to violate ethical and moral norms;
- ask only one question at a time;
- if it is necessary make the situation you are asking about realistic and imaginable for the interviewee by providing examples;
- formulate the questions in an unambiguous and comprehensible way, tailor the questions to the interviewee;
- only interrupt the interviewee if it is absolutely necessary, allow the participant time to answer.
- be a well-intentioned and neutral interviewer, do not comment on or evaluate the answers;
- the answer "I do not know" does not necessarily mean that the respondent does not really know the answer, try wording it in another way;
- if you get an unusual or strange answer, ask if you have understood correctly;
- if the respondent gives too abstract responses, ask them to give examples, similes;
- try to be precise with numerical data, e.g. if the subject gained significant weight then ask roughly how many kilos are meant by this;
- if the subject diverts from the topic, orient them back to the main topic in a polite way;
- at the end of the interview ask if there is any other information, opinion that they may want to share with the researcher;
- at the end of the conversation thank the participant for their co-operation and make sure the conversation ends on a pleasant note. In Ottília Solt's words: ***"do not leave totally confused, agitated, desperate subjects in the ring".***

After the interview

It may happen that you do not interpret the respondent's views or opinion appropriately. According to Smith, despite your efforts you cannot interpret the interview data objectively and without bias in every case. Therefore the researcher may see the subjects of the interview again in order to clarify whether he interpreted correctly what has been said.

It also may be a problem that respondents may have been frustrated and stressed during the interview, and it turns out afterwards that they could not express their opinion for some reason.

Processing the interview

What has been said during the interview can be recorded by making notes, using a dictaphone or a video recording. Typing the whole text is a laborious task but it makes it possible

to convert the text into data or to analyse them (the procedure of the latter is not described here as it is beyond the realms of the book, but several works on research methodology describe its implementation). With a greater number of elements in the sample the responses belonging to a given question can be placed next to one another and analysed. The computer software ***ATLAS.ti*** can also be used for text analysis.

Validity

After presenting the main research instruments, it is essential to deal with the topic of their validity. Validity expresses that the well-implemented research is congruent with reality. One of its forms is *internal validity,* which looks at the pertinence of the cause and effect relationship between the observed independent and dependent variables. By *external validity* the degree to which the obtained results can be generalized to the population is assessed.

Cook and Campbell identified 12 types of external variables to evaluate internal validity. If they are not checked against the variable examined by the researcher, the inferences will not exactly correspond with what happened during the research.

- ***History:*** it refers to events and different environment which occurred during the introduction of a treatment in the time period between the pre- and posttest. For example: the event was much discussed in the media, and the attention directed at it may have influenced the responses of the target audience. That is why the researcher has to pay attention to changes taking place at the site of the study. However, it may mean protection that the effect may concern both the experimental and the control group.
- ***Maturation:*** it refers to the fact that the participants themselves change over time from a perspective that is not connected with the concrete event such as fatigue, increase in body weight, being informed, and these changes may influence the results.
- ***Testing:*** the repeated examination of a process influences the performance in itself. For example if you measure how prejudiced the participants are using a pretest, then with some kind of intervention this is influenced, and then a posttest is carried out. With the posttest the participants will be more sensitive in their approach to the questions, and will answer more carefully.
- ***Instruments:*** there may be several kinds of instruments available to measure the dependent variable. If a more sensitive instrument is used at the time of the pretest than for the posttest it may show a seeming decrease. Use of the same measuring procedure is recommended.
- ***Approaching the mean:*** it may happen that among the participants of the experiment there are subjects who showed extreme scores in the beginning. These participants are more likely to lean to the positive direction on their values than average participants.
- ***Selection biases:*** this error refers to the selection of subjects, and their division into experimental and control groups. Although the researcher sets up certain criteria of exclusion and inclusion, e.g. in case of assessing a serious illness it may include certain subjectivity.
- ***"Mortality" in the experiment:*** it refers to the drop-out of participants in the experimental and control groups, which makes comparison difficult at a later time.
- ***Order:*** it refers to the issue whether the sequence of the experimental stimulus and the dependent variable is certain. It may happen that the dependent variable caused a change in the experimental stimulus.
- ***Diffusion of effects:*** it may occur when the experimental and the control groups mix, and part of the experimental stimulus is passed on to the members of the control.
- ***Compensation:*** in case of experiments carried out in real life situations it may occur that members of the control group have to miss something, in such cases e.g. nursing staff may compensate the control group members with increased care, which may modify the examined effect.
- ***Equalizing rivalry:*** in case of experiments carried out in real life situations, it may occur that members of the control group make efforts to make up for the lack of the experimental stimulus.
- ***Demoralization:*** e.g. the members of a control group not taking part in an educational programme may consider themselves deprived of something, due to which their behaviour changes.

Compilation of database

A database is an organized set of information in which primary information is available on examined persons arranged according to variables. A database consists of columns and rows which contain the responses of the examined persons. All essential information is recorded using mainly numbers, letters, codes in a clearly arranged form. *(Table 2)* Variables appear in the columns in the course of data recording, primary information is below in the rows.

The following is a presentation of fundamentals of database compilation using the Excel programme. It is not aimed to provide fundamental Excel knowledge in the chapter, thus the information written here may be modified, or complemented using acquired information technology knowledge.

Table 2: Number and coding of variables according to question types

Source: Falus, Ollé (2008)

Type of question	Number of variables	Number of possible values of variables	Coding
one response option	1 variable	number of possible choices	numbering of response option
several response options	as many variables as response options	dichotomous (marked or not marked)	it may be 1 if marked it may be 0 if not marked
degree, scale	as many variables as items to be valued	possible values of the scale	the numerical value of scale itself is the code
rank order	as many variables as responses to be ranked	possible values of the rank order	the rank order score itself is the code
open questions	responses considered within a particular question	as many categories as needed for the responses	code numbers assigned to textual categories

Database compilation using Excel programme

The applied instrument can be either a questionnaire, document analysis, observation, or structured interview, the generated primary data can generally be recorded in the used programmes in the following way:

- If ***one response option is possible*** [e.g. sex: male (1); female (2)], numbers are assigned to the attributes which will be included in the database. It may occur e.g. with a self-completion form that a question is not answered, or several answers are marked though only one should be marked. For such a situation it is worth establishing a so-called error code e.g. NR (no response), or NE (cannot be evaluated).
- If ***there are several response options,*** in most cases each response appears as a separate variable to which the responses ***yes/no*** or ***marked/not marked*** are possible.
- ***More complex form of multi-response questions.*** (Table 3) When you ask about the frequency of certain activities, habits: consumption, symptoms, activity etc. (There are much more exact methods for exploring nutritional habits, the example below only helps understanding in terms of database compilation). In the case above the individual food groups appear as separate variables, and the frequency criteria appear as primary information with the adequate code number.
- ***There may be an even more complex form of multi-response questions.*** Certain activities (e.g. pastime), symptoms etc. may occur at different sites or times as well. In this case the activities or symptoms appear in the rows, sites or times appear in the columns. Unlike in the form above, several responses can be given in one column, as a symptom may arise at several times or sites, and a pastime activity may occur at several sites or times.
- ***With open-ended questions,*** what has been written down by the respondent can simply be typed if it is not too much, and the purpose is not to analyse the content.
- In case of ***degree and scale type questions,*** the numerical values of the response options are written into the data cells.
- In case of ***rank ordered data,*** for example how important certain factors are considered, 1- the most important. The listed factors are in the columns, and the rank ordinal number assigned to them is in the data cells. The variable numbers according to the quetion types and coding are summarized in the table 2.

Table 3: Frequency of consumption of certain dairy products

	Daily (4)	Weekly (3)	Monthly (2)	Yearly (1)	Never (0)
Milk	+				
Yoghurt			+		
Cheese					+
Butter	+				

Data analysis

Analysis of generated data can be carried out in several ways and at several levels. In the following we are going to describe the use and interpretation of statistical methods which are supposed to be known at BSc level. Also they are so frequently used methods in health science that familiarity with them is indispensable from the perspective of understanding and using special literature.

Uni-, bi- and multi-variable data, analyses

If only one variable is examined at a time e.g. age distribution or gender distribution of the sample, a *univariable* examination is carried out. In this case the variable is valued in itself. If you seek the answer to the question whether male or female patients spend more time in hospital after an operation, two variables (gender, number of nursing days) have to be connected at the same time. These examinations are called *bivariate* examinations. When the interaction of three, four or more variables are valued, it is called *multivariate* examination. E.g. how the gender of the patient, the applied mode of analgesia for example,. affect the number of days spent in hospital after the operation.

Univariable analyses

The purpose of univariable analyses is primary introspection into data structure by analysing the variables in the database one by one. Data obtained through measurement or observation are called *primary data*. However, if you do calculations on the data (data transformation) either on the data themselves (e.g. each item in a given set of data is squared), or a new variable is created (e.g. BMI-kg/m^2 is calculated from body weight and height values; or the index number of a standard questionnaire is calculated based on the numerical values of responses to questions), then *secondary data* is obtained.

Calculation of frequency and percentage distribution by Excel programme

Using fundamental Excel knowledge there are several possibilities to calculate the frequency distribution of basic data. Only one possible method is described here (Tables 4 and 5)

Middle value measures

Grouping, condensing data obtained during different measurements allow for comparison with other research results, and exploration of differences and correspondences. When middle values are calculated, a single measure is used to express the basic tendency of values.

Table 4: Frequency calculation using Excel programme

Number	Task
1.	Click on any cell of the database which contains data
2.	*Data* menu – *pivot table and pivot Chart Report* – selection of source and type of pivot (option by the programme can be used) – *next* – selecting the range to be analysed (in a basic case the whole field is selected) – *next*
3.	Choose the *layout* tab at step 3 of pop-up window
4.	On the right of the appearing window there are the variables from which the one to be analysed is dragged into *data and row* as well* – then OK
5.	After OK, return to the window of step 3 where you decide where you want to place the finished pivot
6.	It is expedient to choose an already prepared, that is an *existing worksheet*
7.	Change to the worksheet where you want to place the pivot, click on any cell, then *finish*
8.	The obtained pivot includes the codes of the given variable and related frequency values
9.	Each variable is analysed in the above steps one after the other, possibly placing the finished pivots below one another in order to make them clearly arranged

* If numbers are used to code nominal values, the numbers are added up automatically by the programme, so Sum/gender (if distribution of gender is examined) appearing in the data section is double-clicked the wanted (e.g. count) field statistics, and other descriptive statistical indicator can be given as well optionally. If you want to generate several indicators at the same time, drag the variable to be examined to the data according to the number of variables.

Table 5: Calculation of percentage distribution by Excel programme

Number	Task
1.	Pivots placed below one another are selected (the simplest way is to use the column identification) – *copy* – if you used the column identification, click on any column – right button of mouse (or edit menu) choose the value-order of pasta special –, then OK. As a result of these steps, you obtain tables including the simple values of the pivot
2.	Click on the cell next to the first partial result of the first pivot
3.	Equal sign, then the first partial result divided by the total end sum – and F4 once (e.g.=K16/K20 – enter – return to the obtained number - % icon – with the black cross in the right corner of the cell drag the formula to the other pivots obtaining in this way the percentage form of each value

Mean

An average (arithmetic median value) can be calculated from data measured on an interval scale. It refers to the arithmetic average of the observed values which is calculated by dividing the values of observations by the number of observations. A normally distributed variable is well-demonstrated by the mean value, but it is sensitive to extreme values.

Median

A median is the middle value of the sample, half of the observations are larger, the other half of the observations are smaller than the median. To calculate it, arrange the items of the sample in ascending order then find the middle value. If the middle value includes two even numbers, the median is the mean of the two middle values. Unlike the mean , it is not sensitive to extreme values.

Quartiles

The obtained values are arranged in an ascending order, count up to a quarter of the cases, this will be the 1st quartile (a quarter of the sample is smaller, three quarters of the sample are larger), the median is identical with the 2nd quartile, the third quarter will be the 3rd quartile (three quarters of the sample are smaller, one quarter is larger). Thus, the three quartiles divide the sample into four equal parts. The interquartile half-range is the middle part of the data divided by the quartiles, that is the area between the 1st and 3rd quartiles. By complete exclusion of extreme data it typifies the set of data properly.

Mode

It is the value of the sample that most often occurs, or the middle value of the group possessing the highest frequency. It may occur that there are two values among the data whose frequency greatly differ from the others, this is called ***bimodal distribution***. Its possible cause is that the data comes from two partial data sets.

Measures of dispersion

The feature that subjects of the sample differ from the middle value, is called dispersion of the sample.

Range

The distance between the extreme values of the sample is called range. It is the difference between the smallest and the highest value. It is used to picture the striking and extreme values.

Variance (dispersion square)

The deviance of each item in the sample from the mean is squared, and the obtained squared values are summed, thus you get the squared sum (the sum of deviance squares). Dividing the squared sum by the degree of freedom, variance (quotient of squared sums of the sample and the degree of freedom) is obtained.

The ***degree of freedom*** in the denominator shows how many elements of the factor in the numerator are independent of one another. That is you divide not by the number of values but by n-1.

Standard deviation

The most often used indicator in typifying healthcare and medical data is the standard deviation (SD). Standard deviation (square root of variance) means to what degree the values of the sample are spread around the mean.

In case of continuous variables at least 75% of the values in the sample fall within the mean±2SD range in every case. If the distribution of the sample is similar to normal distribu-

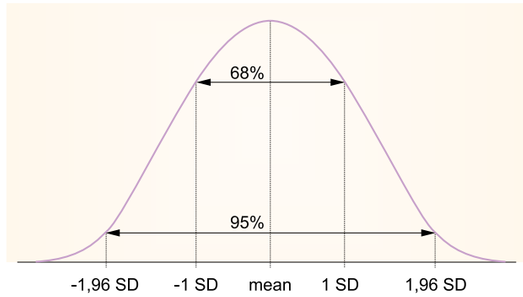


Figure 2: Standard deviation of the values in the sample around the mean (normal distribution)

tion (Figure 2.), then 68% of the observations fall within the mean±1SD range, 95% in the mean±2SD range, and 99.7% fall within the mean±3SD values. Standard deviation is used with symmetrically distributed numerical variables always denoting the mean as well.

Standard deviation refers to the elements and values of the sample, it signals their deviance from the mean. Assuming that sampling is carried out a 100 times and the mean is calculated in each independent case, the standard deviation around the "large mean" will follow a normal distribution. The value of standard error (SE) of the mean signals this spread around the mean of repeated measurements. The SE value is always smaller than that of standard deviation. SE=SD/√N

Percentiles

A percentile (the word is of Latin origin: "per centum" meaning "percentage") means a real value of the sample below (and above) which a given proportion (%) of the sample can be found. Percentile 50 equals the median value, half of the observations are below and half are above the value. It is most often used to compare given or normal data, e.g. to measure growth (weight, height), intelligence and other abilities or qualities. Reference ranges of laboratory results are often given in percentiles.

Calculation of middle values and standard deviation in Excel programme

Middle values can also be calculated in several ways in Excel programme (Table 6), one of which is described here.

The name expected value means average here (Figure 3). Of course the middle values above can be calculated separately through *fx* functions as well.

Hypothesis review

Data collection on a given sample is aimed at being able to draw conclusions on the population based on the sample data. Through the sample it is examined whether your assumption (the hypothesis) is true or not on the whole of the population.

weight		*systolic blood pressure*	
Mean	77,7	Mean	139
Standard Error	3,3	Standard Error	3
Median	79,0	Median	136
Mode	87,0	Mode	137
Standard Deviat	12,8	Standard Deviati	12
Sample Varianc	163,5	Sample Varianc	154
Kurtosis	-0,9	Kurtosis	0
Skewness	0,0	Skewness	1
Range	40,0	Range	45
Minimum	58,0	Minimum	120
Maximum	98,0	Maximum	165
Sum	1166,0	Sum	2082
Count	15	Count	15

Figure 3: Table of results generated during calculations of middle values (regarding body weight and systolic blood pressure) in Excel programme

Hypotheses may refer to the distribution of the population, or to a parameter. Hypothesis testing is a determination of whether these assumptions are realized. A *statistical decision* is made when assumptions about the population are checked, their appropriateness or inappropriateness are determined on the basis of the data coming from the sample. Hypothesis testing serves the purpose of checking, based on one or several samples, the appropriateness of such proposals of whose appropriateness you are not convinced of. Hypothesis testing is carried out through trials, it is essentially calculating the value of the so-called trial function, to see if it falls in the pre-selected acceptance range or the critical range. In the former case, the hypothesis is accepted, in the latter the hypothesis is rejected.

The formulated hypotheses are called null hypothesis (HO), the opposite is called alternative hypothesis (H1). The two mutually exclude each other, both cannot be true at the same

Table 6: Calculation of middle values and standard deviation by Excel programme

Number	Task
1.	*Tools menu – Data Analysis* (it has to be activated before the first usage with a check sign in the *Add Ins submenu – Analysis tool pack and Analysis tool pack VBA boxes*)
2.	*Descriptive Statistics* – select the variable(s) involved in the analysis into the *Input Range* – Check the *Labels in first row* and *Summary Statistics boxes*
3.	The results can be placed in: *new worksheet Ply or new Workbook or Output Range*, by chosing the last one place the cursor in any cell – OK)

time. In a general sense, a null hypothesis expresses that there is no difference between the observed and expected (theoretical) frequency. The observed frequency is the set of data which is gained through data collection, and the expected theoretical frequency is what we could get according to the form of a known distribution. (cheese)

Statistical decision-making possesses potential errors (Table 7). A type I error occurs if the H0 is true but it is rejected. Its probability is provided by the significance level e.g. p≤0.05, then 5 decisions out of a hundred are wrong, even if H0 was true in all 100 cases. A type II error is committed if H0 is false, but still it is not rejected. Its probability is denoted by β, 1-β quantity is called the strength of trial.

Statistical hypothesis testing is determined by the purpose of the examination (description, examination of correlation or difference), samples available, number of variables as well as the type of collected data. In addition to descriptive statistical analysis described earlier, some of the statistical methods in Table 8 are going to be presented below but the other methods can also be found in the special literature.

Table 7: Summary table of possible errors in statistical decision-making *Source:* [38]

In unfamiliar reality	Null hypothesis	
	accepted	*rejected*
Null hypothesis is true	right decision	type I error
Null hypothesis is false	type II error	right decision

Table 8: Summary table of frequently used statistical methods according to Iván Falus and János Ollé [15]

Descriptive statistics			
Frequencies	*Middle values*	*Standard deviation*	
absolute	mean	standard deviation range	
percentage (relative)	mode	interquartile semi-range	
cumulative	median	mean deviance	
		variance	
		standard deviation	
		relative standard deviation	
Mathematical statistical difference examinations Is the difference significant?			
number of samples	*types of data*		
	interval	*ordinal*	*nominal*
one	one-sample t-test	Wilcoxon-test	cross table analysis χ2-test
two	two-sample t-test *f*-test	Mann-Whitney-test	cross table analysis χ2-test
more	variance analysis (ANOVA)	Kruskall-Wallis-test	cross table analysis χ2-test
Mathematical statistical correlation examinations *Is there a close correlation?*			
number of variables	*types of data*		
	interval	*ordinal*	*nominal*
two	correlation calculation	Sperman-type rank order correlation	cross table analysis χ2-test
two or more than two	regression analysis		
more than two	partial correlation calculation		
	factor analysis		
	cluster analysis		

Confidence interval (CI)

Confidence interval or reliability range (MT in Hungarian) is an instrument which predicts the relationship between the population and the sample, the accuracy of prediction for the whole population based on measurement of the sample. Thus CI is a unit of measure of the population, not of the sample. CI shows what range the measured value would fall in with the given probability if there was an infinite number of measurements. CI can be defined for discrete (prevalence CI) and continuous (mean CI) variables based on the formulae presented below in Excel programme, SPSS and other statistics programmes give the value of confidence interval without calculating it separately.

Prevalenc CI and its calculation in the Excel programme

Prevalence CI can be calculated according to the formula below in the Excel programme. In the interest of being followed more easily, the formula is broken down into its parts, and the calculations have been made in several steps (Figure 2, Table 9). Its starting point is a cross table in which attributes of one row can be examined at a time (in one step).

$$pCI = p \pm 1.96 * \sqrt{\frac{p(1-p)}{N}}$$

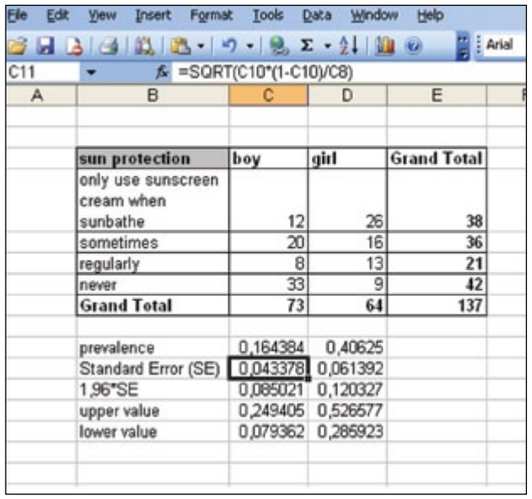


Figure 4: **The starting cross table and the pocedure for calculation of prevarence CI in Excel programme**

Interpretation of obtained results

- In the sample 16% of boys, 40% of girls only use sunscreen cream when they sunbathe according to the frequency value.
- Taking CI into account with a probability level of 95% in the population, 7-24% of boys, 28-52% of girls use sunscreen when sunbathing.
- As can be seen in the diagram the ranges are not overlapping at all, so at the given probability level there is a real difference between frequencies, just like in our case (Figure 5).

Table 9: Procedure for calculation of frequency confidence interval in Excel programme

Number	Task
1.	Create of *cross table* (contingency table) of the variables to be examined
2.	Calculation of SE (Standard Error)=SQRT(p*(1-p)/total sum of the given column), p = number of prevalence
3.	Multiply the obtained value by 1.96 (with a probability level of 95%)
4.	Calculation of the upper value of CI – the value obtained in step 3 is extracted from prevalence
5.	Calculation of the lower value of CI – the value obtained in step 3 is added to prevalence
6.	Make the diagram: select the names of data sets/variables (here the words ”boy” and ”girl”) pressing the Ctrl button select the numbers of prevalence
7.	*Chart Wizard* (icon or Insert menu) – select *type of column chart – finish* after necessary labelling
8.	Right mouse on one of the blue columns – *selecting the panel Format vata series – Y Error Track* tab
9.	Set the cursor on the + signed cell in *Custom* then select from the calculations the numerical values of 1.96*Se (in this case the value referring to two sets of data). This step is repeated in the –signed setting cell too

- If one interval includes some value of another interval (that is they overlap), then there is no significant difference.

Calculation of mean CI in Excel programme

Calculation of mean CI in Excel programme is done according to the formula below in Excel – in which SD means Standard Deviance, ”n” under root means the number of elements. (Figure 6, Table 10)

$$\text{meanCI} = \text{mean} \pm 1{,}96 * SD / \sqrt{n}$$

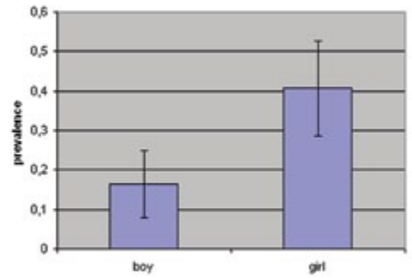


Figure 5: Procedure for calculation of frequency confidence interval in Excel programme based on the example of the use of sunscreen cream during sunbathing

Table 10: Calculation of mean confidence interval in Excel programme

Number	Task
1.	Calculation of mean, standard deviation, count using functions (regarding every set of data to be compared, in our example body weight measured on two occasions are compared, but it is also possible to analyse several sets of data having the same parameters)
2.	Calculation of SE (Standard Error) – click on the value of standard deviation – divided by the root of piece
3.	Multiply the obtained value by 1.96 (in case of a probability level of 95%)
4.	Calculation of the upper value of CI – the value obtained in step 3 is extracted from the mean
5.	Calculation of the lower value of CI – the value obtained in step 3 is added to the mean
6.	Making the diagram is the same as with frequency confidence interval, but after selecting names of data sets/variables select the numbers of the mean.

The t-test – with data interpreted on an interval scale

The t-test is a statistical test that is used for comparison of means. Two forms are differentiated based on what sample(s), are available.

The use, conditions and calculation of one-sample t-test in Excel programme

If data comes from the same people as a result of two different measurements, a one-sample t-test can be used to determine the probability of a significant difference between the middle value (mean) of the two variables. At 95% probability level, if the difference of the two means

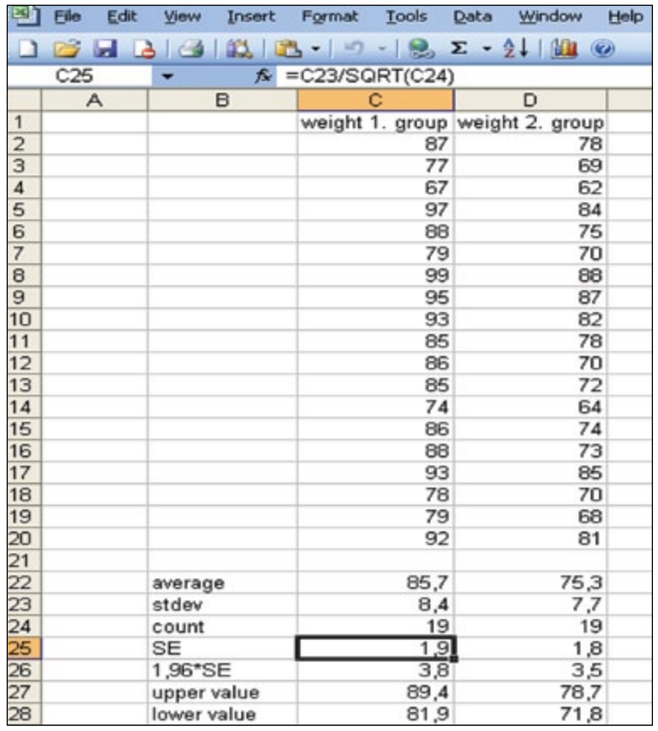


Figure 6: Calculation of mean confidence interval step by step in Excel programme

is larger than double the standard deviation of the two distributions, the difference between the averages is significant. In addition to that, the t-test also takes into account the number of elements with the increase of which the prediction of standard deviation of means becomes more accurate.

This examination design is also called self-control or paired-test. In other words, it is examined whether there is a change in the members of a group, if a factor exerts some influence on them.

Though measurements can be made several times, only the data of two mesurements can be compared at a time through this method. E.g. the data of the first and the last measurement.

Important conditions which are worth looking at during data collection:

1. With comparison, the same variable or variables have to be examined.
2. If the basis for comparison is performance, repeating the same set of tests may bring about a more positive result due to the familiar tasks.
3. With cohesive samples, the analyses are based on the changes of individuals, that is if a participant was present only at the first or last measurement, it has to be fully omitted from the analysis (though most statistical programmes complement the missing parameters with average values). If one or more participants are left out due to this, it has to be mentioned in the description of the research.
4. When a difference is examined, several variables can be examined. You make as many statistical analyses as many variables you examine.
5. Due to data protection regulations, a code has to be assigned to the examined persons in order to match their data at the beginning and at the end of the examination.

When publishing the results, it is important to give mean values as well apart from the significance value in order to be able to judge the direction of change. At 95% probability level, if $p<0.05$, it can be called a significant difference. The sign of the t-value shows the direction of change in relation to the initial state. With a negative sign the later state shows a larger value, with a positive sign it is the earlier state. The procedure for calculation is shown in Table 11 and Figure 7.

Interpretation of the t.test: it can be stated based on the above test that the body weight (kg) decreased significantly ($p=0.016$) as the value of p is smaller than 0.05. Regarding the average body weight, it decreased from 83 kg to 79 kg. In summary: ***Compared to the first measurement, the average body weight of patients (83 kg) decreased significantly (p=0.016) by the second measurement (79 kg).*** This sentence format contains the name of the variable concerned, their values, the degree of significance (also numerically) as well as the direction of change ("decreased").

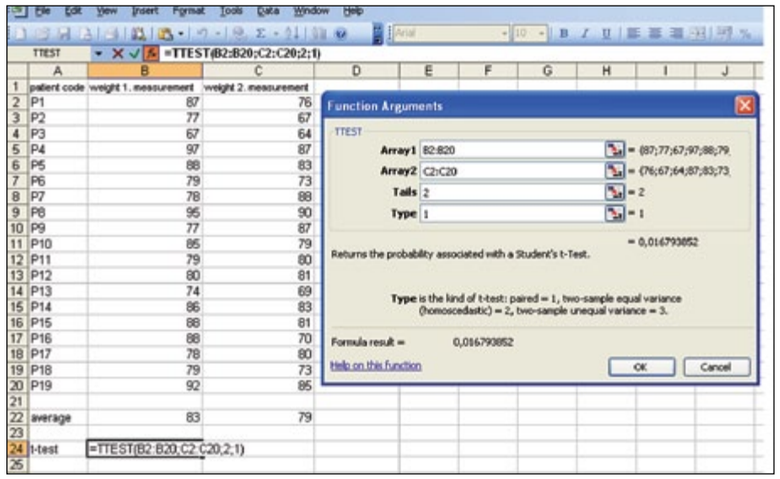


Figure 7: Screenshot of calculation of one-sample t-test in Excel programme

Table 11: Procedure for calculation of one-sample t-test in Excel programme

Number	Task
1.	Calculation of means regarding every sample, partial sample
2.	Put an equal sign in any cell – fx function – statistical – TTEST function
3.	Selecting Array 1 the first set of data (only the data)
4.	Array 2 the second set of data
5.	Tails – as setting 2
6.	Type – in this case 1 – ready

The use, conditions and calculation of two-sample t-test in Excel programme

The two-sample t-test can be applied to compare the arithmetical average of two independent, different (consisting of persons belonging to two different groups) samples. The aim of the test may be to compare a case group (who undergo an intervention) and the control group (who are free of intervention), or two completely independent groups, for example males-females, village people – city people.

It should be noted:

- It is not necessary to have the same number of elements in the two samples.
- It is not necessary to be able to identify exactly the subjects of the two samples and follow them.
- In case of a two-sample t-test, it is necessary to examine whether there is a significant difference between the variances of the two samples. The comparison of variances is carried out by the F-test.

A two-sample t-test can only be done if there is no significant difference between the variances determined on the basis of the results of the two groups. The f-test is used to establish this.

In Excel it can be carried out using the f-test, if the obtained value here is larger than 0.05, there is no significant difference between the variances of the two samples, that is the two-sample t-test can be done.

If the value obtained by the test is $p<0.05$, between the two samples there is a significant difference which is not due to chance. If the obtained value is $p>0.05$, the difference is not significant (even if mean values differ). Similarto what has been mentioned previously with the one-sample t-test, it is important to present the mean values when publishing the results.

Use, conditions and calculation of Chi-square test in Excel programme

The Chi-square test ($\chi 2$-test) measures the statistical significance of the relationship between two variables on data transformed categorically on a nominal and ordinal scale as well as on an interval scale. The starting point of the test is the cross table or contingency table: the table where rows and columns are determined by the categories of the two nominal variables chosen for analysis.

Condition and essence of the test:

- The test is sensitive to sample size, as the chi-square is linearly dependent on the number of sample elements, in this way it may occur that it does not show a significant result with low distribution (30 persons), while it does with a relatively high number of elements (100 persons);
- In case of a large number of scale categories, there will probably be several cells which contain a low number of observations. A solution to this can be recoding, creating new categories, or increasing the number of elements through further data collection.
- Limits connected to cell values:
  - The expected value in each cell must be at least 1;
  - There may be a lower value than 5 in 20% of cells at most. A more rigorous version of this is that a cross table cannot be regarded reliable if the values of each cell are below 5.

Details of the procedure for the calculation of the Chi-square test in Excel programme can be found in Table 13 and Figure 8.

Table 12: Calculation of two-sample t-test in Excel programme

Number	Task
1.	Calculations of means regarding both samples
2.	Put an equal sign in any cell – fx function – statistical – FTEST function
3.	3. Selecting Array 1 the first set of data (only the data)
4.	4. Array 2 the second set of data – ready*
5.	5. Put an equal sign in any cell – fx function – statistical – f.test function
6.	6. Selecting Array 1 the first set of data (only the data)
7.	7. Array 2 the second set of data
8.	8. Tails – as setting 2
9.	9. Type – 2 or 3 (according to result of FTEST) – ready

* you obtain the result of the f-test, if the obtained p-value is larger that 0.05, so there is no significant deviance between the variances of the two samples, that is the two-sample t-test can be done.

Evaluation of relationship between continuous variables using correlational coefficient

The aim of calculating correlation is to examine the relationship between two measured variables on one sample or on a partial sample. Both variables should be measured data types, but it is not neccessary for them to have the same value range. Any of them can be data coming directly from the subjects of the examination, e.g. systolic blood pressure, and it can be a complex variable calculated by the existing information as well, e.g.: BMI.

The *correlational coefficient* shows correspondence between the variables, that is what tendency the paired values of variables experienced with respondents mostly show. It is denoted ***rxy***, where *r* stands for coefficient, *xy* stand for the variables whose correlation is analysed. The correlational coefficient is an artificial measure which falls between the values of −1 and 1 in every case. A decimal fraction is obtained through its calculations which is usually made rounded to three decimals.

Every correlational coefficient includes two types of information: 1) the ***sign:*** a positive sign shows identical direction, that is if one of the variables increases, the other also increases, a negative sign shows an opposite direction, with one variable changing, the other decreases as a result. 2) ***the coefficient distance between -1 and 1*** refers to how close the correlation is. The nearer it is to one of the extreme values the stronger the correlation is (Table 14). If the value is around zero, it shows the lack of correlation, correlationlessness. If there is no linear correlation, the value of the correlation coefficient is: 0, in case of perfect positive correlation +1, in case of perfect negative correlation it would be -1.

Table 13: Procedure for the calculation of the Chi-square test in Excel programme

Number	Task
1.	Make the cross table from the database *(using Pivot Table and Pivot Chart Report, see descriptive statistical analysis, description of pivots – in the layout window drag the variables to be examined in the row and to the data (generally the dependent) variable, the other (independent) variable into the column – click on any cell in a new or an existing worksheet – finish).*
2.	Calculate the frequency of individual columns – the sum total of the column divided by the complete sum total – for every column (in our example: 73/137 then 64/137).
3.	Calculation of the expected value: multiply the row sum of the relevant cell by the column sum of the relevant cell and finally divide the obtained sum by the complete sum total (total number of elements). Instead of calculating cell by cell the use of F4 key is suggested. (In simple words: click on the first cell of the expected value, equal sign – number of frequency – press F4 twice – multiply – the sum total of the first row of observed table – press F4 three times – enter – drag to all cells using the black cross in the bottom right corner of the cell*.
4.	Equal sign in any cell – choose CHITEST function from f_x statistical functions (or write the function directly into the cell), select the Actual range (without sum total) in the observed cell of the opening window, and the obtained expected values in the expected range cell (without the sum total), pressing the OK button you obtain the p value.
5.	If the obtained value is smaller than the threshold value stated by you, you reject the null hypothesis and accept the alternative hypothesis, that is there is a correlation between the examined variables (in our example the p=0.000, that is there is a correlation between gender and the use of sunscreen cream).

* The expected value calculated based on the table of observed values is the value which you would obtain if there was no relationship between the two variables whatsoever. According to the example: only 12 boys used sunscreen cream regularly in the sample, if there was no difference between boys and girls, 20 boys would have to use it regularly.

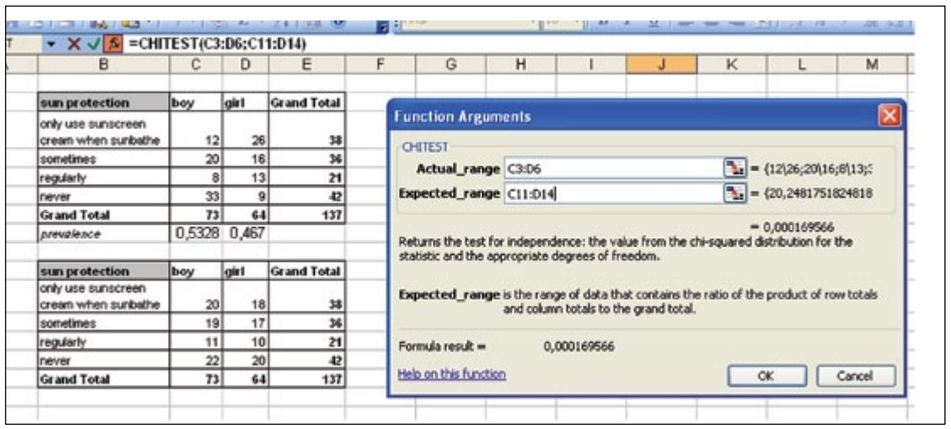


Figure 8: Screenshot of procedure for calculation of Chi-square test in Excel programe

Conditions of calculation of linear correlation coefficient

- The sample has to be selected randomly.
- Both variables (x and y) of both subjects must be known (though programmes provide the mean value if there is lack of data).
- The values of the two variables must change in the same direction all through the whole measurement range, the coefficient cannot be interpreted if x increases and y increases for a while then it starts to decrease.
- Samples from two populations cannot be combined, observations are independent of one another.

Table 14: The correlation coefficient and the values determinimg the strength of relationship

Correlation coefficient	Strength of relationship
0–0.25	no or very weak
0.25–0.50	weak
0.50–0.75	moderately strong or strong
0.75–1.00	quite strong

- X and y samples must come from a population of normal distribution. If it does not exist, not the parameter procedure, but Spearman correlation coefficient calculation is carried out instead.

Calculation of correlation in Excel programme

A function is used to calculate the correlation coefficient in Excel programme (Table 15, Figure 9). In the course of regression calculation, which is going to be presented in the following subchapter, the correlation coefficient is also calculated, therefore it is often not calculated separately.

Evaluation of the relationship between continuous variables with regression coefficient

Regression analysis is a procedure in the course of which the relationship between a metric dependent variable and one or more independent variables is analysed, through which the regression linear formula that best fit the points can be stated. The regression formula describes mathematically the relationship between variables, and it, with the x value known, allows for inference of the y value. The existence, direction and strength of relationship are examined. The fundamental difference between regression and correlation calculation is that with the latter you look for an estimated value, and you do not know the relationship of the variables, that is which is the dependent and which is the independent variable, but it must be known with regression analysis.

The strength of the relationship between the dependent and independent variable is measured by the r^2 determination coefficient, whose value varies between 0 and 1. The r^2 value expresses to what degree the changes in one variable go together with changes in the other variable expectedly, that is how much one of them can be used to predict the other. It shows to what percentage the independent vari-

Table 15: Calculation of correlation coefficient in Excel programme

Number	Task
1.	1. Select *correl* function from f_x statistical functions.
2.	In the appearing window in *Array 1* you can give tha data of one variable, in *Array 2* the data of the other variable by the method of ”click – drag” or by referencing the first and the last cell – *OK.*
3.	The value of the obtained coefficient in our example examining the relationship between BMI and diastolic blood pressure (DPB) r=0.463 – that is there is a positive correlation between the two variables, if one of them increases, the other increases too.
4.	The significance level, which is necessary for the evaluation of the coefficient, can be found in the so-called table of correlation coefficient significance levels if Excel is used. (This table can be found in the appendix of statistical books. It can be searched for with the help of the number of elements in the sample and the degree of freedom (its calculation is number of elements -2) belonging to the chosen probability level. In case of a negative correlation coefficient, use its absolute value, that is without a sign.)

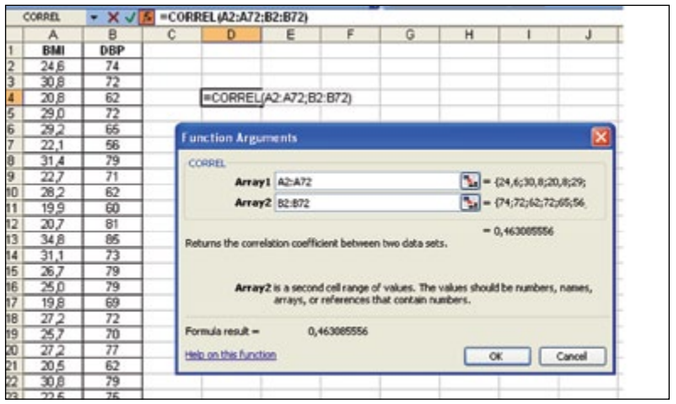


Figure 9: Screenshot of calculation of correlation coefficient in Excel programme

able affects the standard deviation of the dependent variable. The f-test, which is the generalized form of the t-test, is used to test the significance of the determination coefficient.

Calculation of regression in Excel programme

Regression calculation is done by a function in Excel programme (Table 16, Figure 10), as a starting point, the researcher has to decide what they considers an independent (x range) variable and what they consider a dependent (y range) variable. Further on, there is the procedure for making a diagram of linear regression in Excel programme (Table 17, Figure 11). In our example the relationship between BMI and the Diastolic Blood Pressure (DBP) is examined, in which BMI is the independent variable.

Interpretation of obtained results (Picture 8):

- value of ***r*** is the correlation coefficient, it shows the positive correlation between the variables
- r^2 value is the determination coefficient, 0.21 which means the independent variable (BMI) determines the value of the dependent variable (DBP) to 21%.
- In the third part of the table, the 0.78 value of the coefficient shows how much a unit change in the independent variable (BMI) (that is a growth of 1 kg/m^2) increases the value of the dependent variable (DBP). In this case, a unit growth of BMI increases diastolic blood pressure by 0.78 Hgmm.
- The p=4.77E-05 that is p<0.001 – which shows a significant correlation.
- The values of confidence intervals are also important (0.421; 1.13) both are in the positive range, that is, it can be considered certain that there is a positive direction correlation betwen the variables.

Conclusion and publication of research results

A significant amount of scientific research is time-consuming, labour intensive and needs a significant financial input. The last phase of the research process is when researchers summarize their results and also make them publicly available for the scientific community.

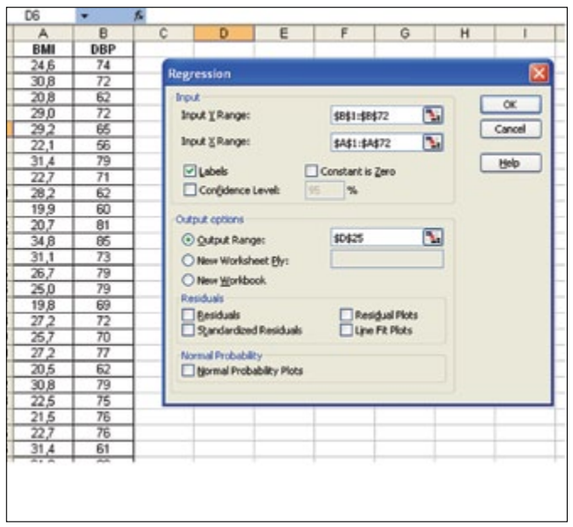
However, before the publication of scientific contribution the research report is made. This is the first written document which allows for a detailed examination of the whole process of the research with all its stages. For this very reason the research report usually follows the research process

Table 16: Calculation of regression in Excel programme

Number	Task
1.	*Tools* menu – Data analysis* – Regression.
2.	In the pop-up window click on and drag the values of the dependent variable [in our example diastolic blood pressure (DBP)] in *Input y range,* and the values of the independent variable (here BMI) to *Input x range.*
3.	Tick the *Labels* order.
4.	elect the possibility referring to the placing of calculations at the output range. The table of results can be placed in a new workbook, on a new worksheet, or a worksheet which existed (Output Range) when the output range was selected, by clicking in the wanted cell (you see a broken lined cell frame) – OK.

* (If it cannot be found, it can be activated through Adds-In see calculation of the middle value in Excel programme)

structure described previously, but it is also complemented with further subdivisions. One of these is for example the abstract (a short summary of the research), the introductory chapter – it includes the antecedents, motives of the research – the list of literature that has been used, the list of those who participated in the research, length of research, acknowledgements. A research report is usually made for the sponsoring institute of the research, but with permission they can be made public in full e.g. in libraries, or nowadays on the internet as well.



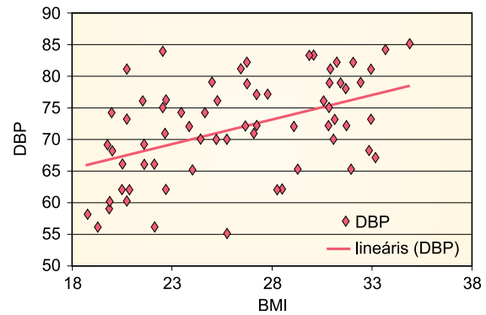


Figure 11:. Description of linear regression in Excel programme for examination of correlation between BMI and diastolic blood pressure

Figure 10: Screenshot of calculation of regression in Excel programme

Figure 12: Picture of the table of regression calculation results in Excel programme

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,463
R Square	0,214
Adjusted R Squa	0,203
Standard Error	6,914
Observations	71,000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1,000	900,501	900,501	18,836	0,000
Residual	69,000	3298,654	47,807		
Total	70,000	4199,155			

	Coefficient	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	51,110	4,790	10,670	0,000	41,555	60,666	41,555	60,666
BMI	0,780	0,180	4,340	0,000	0,422	1,139	0,422	1,139

Table 17: Making a linear regression diagram in Excel programme

Number	Task
1.	Select the variables to be examined
2.	*Chart Wizard – select XY (Scatter) type diagram*- further steps are like the ones for making a diagram, after the needed labelling (title, axis labels) – *finish*
3.	3. Right mouse on one blue data point – *Add Trendline – Linear – OK*
4.	4. if needed, using *axis formatting* by modifying the scale division you obtain a more clearly arranged diagram.

However, scientific contributions are rarely publicised in the form mentioned before. The results of scientific research are published much more often in specialized journals, chapters of specialized books, or as a complete book. There is also information on these in the chapter called *Literature research in nursing,* but they are detailed in authors' guidelines of specialist journals as well. Here are some domestic and foreign examples:

http://www.elitmed.hu/utmutato.html

http://journals.lww.com/ajnonline/Pages/informationforauthors.aspx http://www.elsevier.com/wps/find/journaldescription.cws_home/266/authorinstructions

In addition to written publications, there are numerous possibilities of oral publications as well at domestic and foreign conferences, but conferences are also sites for exhibiting posters.

International nursing conferences: http://www.conferencealerts.com/nurse.htm

International dietetics conferences:

http://www.allconferences.com/Health/Nutrition/

International Emergency provision conferences: http://theconferencewebsite.com/search/?search=emergency

International physiotherapy conferences: http://www.wcpt.org/events

Application of research findings

Results of scientific research are really successful when they are applied in practice. Evidence-based practice, which has been mentioned in a few words in the chapter, is built on the intention to create, strengthen a nursing practice based on the results of nursing research.

In evidence-based practice, it is emphasized that it is important to apply the evidence from clinical research in everyday healthcare decisions. It calls attention to the fact that in order to implement effective, safe and efficient preventive and healing work, it is necessary to apply the results of research done with scientific thoroughness, and to apply regularly the guidelines, professional protocols based on them in addition to individual intuitions and individual experience.

We are not saying that individual experience will lose its significance in the future, however it has to be connected with the use of scientific results, in this way the healthcare process will have a better chance of adjusting to the claims of patients and together with this of those working in healthcare provision.

Recommended reading: http://www.pro-qaly.hu/bizonyitekokon-alapulo-gyakorlat-jelentosege-es-alapelvei-173.html; http://www.pro-qaly.hu/minoseg-az-apolasban-50.html; http://www.pro-qaly.hu/bizonyitekokon-alapulo-egeszsegugy-128.html

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8. Ethical Aspects of the Nursing Profession

(Extract from ETHICS)

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Moral issues of nursing and the ethics of nursing care:

Morals, morality, ethics

Nursing is only one of the fields of life where one is faced with the constraint of moral choice.

What is meant by ethics and morals? Both words refer to the complexity, the theory and the practice of correct and incorrect human behaviour.

The word morals comes from the Latin 'mos'. Its basic meaning is the will of the community which is represented in law and customs. In a wider sense it can also mean the individual's will, approach, his cast of mind and morality. Morals and morality – (Latin: mores, ethic, customs) the word refers to the following:

- the field of personal values and codes of conduct
- codes of conduct controlling our social interaction
- culture specific morals based on religion or ideology.

Morals is defined in the academic encyclopaedia as "a form of social consciousness and practice which has the role of regulating human behaviour in all fields of life in society. It includes historically determined principles, norms and rules of human behaviour." It can be examined within the interaction of philosophy, law, religion, politics and art. Morals is the sum of man's behavioural and conduct norms which have traditionally evolved and been applied in a particular society or culture as well as influenced by legal regulation.

The notion of *morality,* based on Immanuel Kant's (1724-1804) tenets, is primarily used to describe the individual's moral attitude and not the moral characteristics of society or communities.

Ethics is a science with a philosophical approach that deals with morals and moral phenomena. The word in terms of origin has a complex meaning connected to the notions of the Greek words *ethos* and *éthos*. The word ethos means a place of living and related custom and tradition. Éthos, the other component by definition means thinking, way of action, character. The Latin word *mos,* which in Hungarian means morals (the original meaning is will), contains the meaning of both ethos and éthos. Thus morals means customs, traditions, rules, features, behaviour and character at the same time.

Morals or ethic (morality) preferably refers to behavioural norms that are believed and followed by the individual and the group, while ethics is the study or science of morals which activity is often called moral philosophy in scientific terminology.

Ethic: (Old Greek: ethos, community spirit) the word has a double meaning:

1. common system of views and values of a moral community, social or professional group;

2. the discipline of ethics is the practical knowledge and skills of the following things:

- principles underlying moral rules and values
- decision-making skills necessary to implement moral principles in different situations
- decision procedures typical of different situations and appropriate for them.

Ethics is a philosophical science whose subject is morals. In the simplest wording it is all the norms determining human behaviour that are considered right with regard to society or certain groups of people. That is, it is a collective term: it is all the rules and values that are recognised by every member of a community and regarded compulsory for themselves, their behaviour and conduct.

These rules and values are formulated within the evolution of man-world relation sytems in the interest of the individual's and his community's existence. Thus morals is the completed and historically determined ordering principle of human co-operation which evolved through a process.

Dilemma, that is di-lemma in Old Greek, means double layer, figuratively meaning crossroads. It is a situation in which one has to choose between two undesirable options, of course in an ethical sense. That is an insolvable clash between two competing principles or tasks. Not all dilemmas are moral ones, it can also arise from not knowing, in terms of theory or practice, the necessary tools to achieve the desired aim. Moral choice is not always a dilemma either, since many times we know very well what we should do, the question is whether we are going to do it or not. A choice becomes a dilemma when there is a conflict between basic principles in a moral sense, that is, what we believe has to be done, what we believe is good or bad and basing our actions accordingly.

Parts of ethics

1) Descriptive ethics, including:

a) *Moral sociology,* which is a discipline describing the moral principles, behavioural norms of a society. It describes what moral customs, values, norms dominate and what suppositions, judgements, behaviours, lifestyles exist in what era and with what people. It describes the moral state of a society, and what values are preferred by the different cultures.

b) *Moral psychology:* a discipline studying the process of acquiring moral norms. This deals with how moral norms are acquired from birth to adulthood. When a baby is born, it will gradually turn from a biological being into a social being. An infant will only become a social being if he is brought up in society by society. This process is fulfilled by learning, acquiring and practising the norms and rules of society.

2) Normative (prescriptive) ethics:

Normative ethics tells us what we have to do, what values we have to follow, what is morally right or wrong. Thus it points out what values we have to keep in mind in the course of our actions. The ultimate purpose of normative (regulating) theory on duties is to direct us in situations when we are at a crossroads, where we need to make decisions or form judgements.

Normative ethics is based on a rank of values by which the decisions of individual persons are determined. This system of values has a special place in moral decision-making, since priority of values can determine certain decisions. In healthcare, within this system of values, human life, health protection, respect for human dignity, distinguishing morally good and bad have priority. In healthcare, certain moral basic principles and norms are based by normative ethics. Further divisions are possible in normative ethics depending on what level of generalization problems are discussed at.

Parts of normative ethics:

a) *General ethics* deals with conceptions, categories that are universal. General ethics deals with ethics in a general sense, and it is aimed at discussing the general features of practice, together with the general and specific conditions of this practice.

b) The task of *applied ethics,* as a matter of fact, is the in-depth examination of certain professions, aspects, fields, problems. Practical guidance is given how to apply universal norms, it is aimed at special fields where there are activities that concern human relations directly or indirectly, and where there are subordinate and superordinate human relations.

Bioethics, a branch of applied ethics, is a discipline dealing with the ethical issues of the living world, which combines information from sociology, biology and ecology, and then integrates the knowledge from the mentioned disciplines using philosophical methods.

Bioethics tries to systematize those rules, principles, procedures and institutions that help to explain and solve problems related tolife sciences.

Bioethics includes moral issues brought about by the development of science in conjunction with the healthcare system. Its scope of examination should not be limited to individual cases, instead bioethics as an applied science should consider the genearl ethical principles of healthcare rather than the every day practice within hospitals.

3) Metaethics or moral philosophy is the systematic and critical study of different theories that we refer to or can rely on when we are required to justify our moral principles and the decisions based on them. The study of the theoretical background of the sytem of our moral views is called metaethics.

Metaethics examines morals itself, its essence, nature and role -, as well as the content, the meaning of moral concepts, ethical categories and statements, different versions and use of its fundamentals. Its subject is not action but the discussion regarding actions, the language of ethics, the use of moral concepts, the moral'dictionary' by means of which our actions are communicated.

J. Kovács in 2006, identified, four moral principles in relation to bioethics necessary to apply to all moral dilemmas:

- The principle of 'do no harm', primum nil nocere
- the principle of respect for autonomy
- the principle of justice
- the principle of beneficence.

The principle of 'do no harm' (primum nil nocere):

What can be expected from doctors and nurses is to take due care thus diminishing the existing dangers of different interventions to the least possible degree.

The principle of do no harm includes three very important elements which must be complied with both by doctors and nursing staff:

- The benefit and well-being of the patient must be paramount
- They must take due care to reduce the risk of any interventions they make An example of this being when during invasive intervention, like catheterization or an intramuscular injection, a nosocomial infection is caused because the prescribed protocol, through which infections could have been avoided, is not observed.
- The most important message of the Hippocratic oath for nursing practice is the prohibition of intentional maleficence, the avoidance of emergencies, the prevention of harm occurring during nursing.
- B oth advantages and disadvantages of the intervention have to be considered and the intervention can only be carried out if the advantage/disadvantage ratio is favourable. On no account should healthcare workers abuse their position or the opportunities ensured by their acquired knowledge when dealing with patients who are in need of care. This includes protection against physical or pyschological abuse. However, it could be said that if this principle interpreted literally, it would be impossible to observe it, since it would be difficult to carry out an injection without casuing pain to the patient. The distinct difference being the injection is for the benefit of the patient not simply to cause pain and distress.

The principle of respect for autonomy:

Almost all values and norms of modern medical ethics can de derived from the principle of autonomy. Autonomy means that the individual has the opportunity to make independent, responsible decisions in certain issues concerning himself.

In order to make really independent and responsible decisions, there should be two essential factors: on the one hand, the individual must have adequate information, on the other hand he must possess adequate decision-makingskills. The patient should be informed in a way that he can understand, thus he can make an autonomous decision in the course of intervention or treatment.

The vulnerability of the patient within the health care organisation increasingly intensifies as he is often unfamiliar and uninformed in relation to the structure and function of the Organisation.On occasionthe patient will find themselves in an environment which is crowded and poorly staffed , where his own wants and needs are constrained by the needs of the Organisation caring for him. The patient is tested both physically and psychologically by the health care system which seeks to care for him. The patient can only make autonomous decisions if he possesses the necessary and valid information. The doctor-patient relationship, is a contractual relationship, based on trust. From the nurses and paramedical point of view, this relationship should be based on respect for the person, as our main goal is to restore the patient's independence as soon as possible.

In any place of medical attendance the rights which protect and support human dignity have to beassured. It is essential to convey information to patients in a way that it can be easily interpreted by the individual. When basic needs are considered or interventions aremade , the patient's abilities, skill and knowledge have to be taken into account not in a paternalisticway , but by working in partenrship with the patient to address their needs.

There are certain cases where the patient may be unable to make autonomous decisions , in the case of certain kinds of psychiatric diseases, underage patients, mentally disabledunconscious patients.

Megan Jane Johnstone (1989) discussed the abuse of patient's autonomy in the following way:

- Intervening with the patient without consent
- Intervening with the patient when the information provided was not appropriate to his level of cognisance
- Using 'white lies' to encourage patient compliance with interventions

The patient's right to autonomy can be violated by the use of constraints such as bed rails etc even if used for their safety. The limitation and its length have to be prescribed by a doctor, and the fact of limitation has to be documented appropriately as well. It is important that the use of restraints is documented and justified in the patient's record.

Exercising the right to self-determination primarily means respecting autonomy. As opposed to a paternalistic approach, the patient's independent decisions, actions cannot be limited, hindered as long as others' autonomy is not violated. In other words, the patient has the right to make his own decisions concerning his own matters, thus making his decisions according to his own values and views, and others should respect this too.

The principle of autonomy has to be ensured for the individual not only in the healthcare institute but also in his home or living environment.

In community nursing, observance of this principle is expressed through respect for the person, protection of privacy, informed consent, the freedom of choice, the possibility to refuse treatment and the protection of independence.

The principle of justice:

The principle of justice was necessarily brought about by the fact that the quantity of medical aids usable in healing which result from medical achievements and research is limited. Since there is not enough of these scarce social goods, it has to be determined on the basis of a suitable system of criteria who can have a share. Thus the principle of justice appearing in bioethics was brought about by considering the socio-economic environment, in which the moral requirement can conflict with the economic ones.

In medical practice, this has a significant role in working out just distribution principles of high-value equipment, instruments or medicines that are not generally available.

It also belongs to this principle that resources have to be rearranged in the case of a shortage in a field of healthcare.

Financial and procedural justice

The principle of justice has a financial and a procedural element too. Financial justice requires that, within healthcare resource allocation, the primary regulation should already protect and support on good grounds the interests of those concerned in topical priorities.

Procedural justice requires that – considering the primary regulation – the interest of all those concerned should be taken into account when the decision on healthcare resource allocation is made.

Justice appears as the principle of equality in the personal relationship between the carer and thepatient. In health care all patients should have fair access to services regardless of gender, race, age, religion.

The distribution of resources among the departments of a healthcare organisation and therefore to patients is related to the principle of justice.

Most ethical problems are caused by different principles, aspects of rating. It is often not possible to distribute the resources using one acceptable ethical aspect (which can be time, expertise, aid), and that is why professional aspects gain priority. Many times doctors are not aware of the fact that the so-called professional aspects of particular decisions are in fact implicit (hidden, indirect) moral criteria, or that they use moral criteria for rating.

Due to limited healthcare expenditure, the government regulates access to healthcare. Certain priorities are set according to determined aspects. For example waiting for operations, examinations, interventions.

The principle of beneficence:

The principle of beneficence is the most often quoted ethical principle in medical codes of ethics, the most important requirement of the Hippocratic oath which is valid to the present day. Beneficence is the ethical foundation of medicine, since doctors take their oath and their actions to facilitate the well-being of the patient, but it also concerns the science of medicine itself in terms of the goals of medicine.

The principle of beneficence has to include:

a) the principle of positive beneficence, which consists of the following activities:
- prevent harm
- eliminate risk or treat existing factors causing harm to the patient facilitate well being

In terms of ethics it is important to be mindful of the individual, their personal well-being has to be supported and suitable support has to be provided for them.

When the principle of beneficence is used, the factors harmful for the patient have to be recognized, then eliminated.

The principle of beneficence:
- is the duty to do good to others and not harm them;
- the duty to provide for them, the duty to protect the weak and vulnerable;
- the duty of patronage: the protection of the rights of people who are weak, vulnerable and unable to exercise self-determination.

Beneficence or beneficial activity is a must everywhere where dependent or vulnerable patients need support or urgent provision and attention.

However, in everyday life provision care is carried out many times in a way that adults are infantilized or dependence is created through our behaviour.

Using the example of theadministration of an injection , we have to try to reach the most favourable harm-benefit ratio, and due care must be taken in the case of harmful interventions.

b) This is illustrated by the fulfilment of the usefulness principle which is said to be the second component of the beneficence principle. Consequences of every action have to be estimated, and the possible solution bringing about the maximum benefit-damage (advantage/harm) ratio must be chosen.

In community nursing, it is essential for the principles of usefulness and beneficence to be fulfilled when preventing contagious diseases (e.g. vaccinations).

It can be observed and several times it is also proved that the same nursing duty can be carried out in so many ways without its professionality being harmed. In the case of a vulnerable patient, a bedpan can be placed under the patient in a way that ensures the skin is unharmed and dignityis protected . The duty has been fulfilled but what matters i show the intervention is madeIt should also be changed that doctors and nurses on their rounds speak about the patient and do not speak with the patient, as if excluding him from information and decisions that concern him.

Another crucial part of nursing is to what extent dignity is maintained or preserved for those who are dying. In order to make dying more humane, the knowledge that a nurse learns in theory is not enough, here she needs an inner mental urge, calling, which encourages her to help the patient who is 'preparing' for death, leaving the living. This is not a costly activity, there is no financial expense, but the inner beneficence that the nurse can give to another person is all the better.

This fact requires a radical change of approach and humane attitude from present nurses.

The patient should feel that we stand by him. The opposite of love is not hate but indifference. Our patients may not always need our love but they cannot endure our indifference at all.

The mission of nursing as an institutionalized form of care is to help individuals who need healing and attendance or leave life, and not its opposite which is to provide for vulnerable, helpless patients with beneficence completely missing.

From doctors' paternalism to 'the principle of informed consent' in modern medical ethics

Translated into the language of bioethics, paternalism means that the doctor or a healthcare specialist having adequate professional qualification and experience acts or makes decisions as he likes without the patient being asked and having agreed. In this case, the patient, the most important individual is left out of all this, in fact a decision has been made in an issue concerning him over his head.

Aperson , even if he is ill, is entitled to know about his state, the prognosis of his disease, and make a decision about his life as much as he can. It is the duty of the doctor to cure the patient's body and soul, ease his pains and suffering, but along with this he has to enhance the patient's decision-making skills so that the patient can have his autonomy prevail. However, the patient can only make a decision if he is informed. While the improved quality of medical attendance is a priority in our health policy, in many cases only financial problems are regarded to be a challenge although the suitable information provided for the patient, involving them in decisions are at least as important quality factors as the solution to the before mentioned financial resources.

Information given according to the principle of informed consent marks the start of a completely new period in the field of informing the patients and the doctor-patient relationship. Arising from the ethical principle of autonomy, it is the doctor's duty and the patient's right at the same time for the doctor to make it possible for the patient to make decisions. He has to inform the patient about theirdisease, the prospects to be expected, the character of the planned treatments and interventions, the anticipated side-effects or dangers, and prepare him for every contingency that can occur during attendance. Thus the patient can consider the doctor's suggestion and can make a decision whether he undertakes the procedure and the accompanying discomfort or not.

If they are deprived of these important pieces of information by the doctor, then their right to freedom and self-determination is violated, because they will not learn all the important information concerning their forthcoming decision, so they cannot consider things duly and that is why they cannotmake an infored decision.

Informed or *information based consent* is when decisions are made in possession of proper information. The doctor can do what their patient has agreed to do, and the patient can only agree if they are well-informed. It is compulsory to tell the medical truth. If the doctor has withheld certain facts and gained agreement of the patient in this way, this agreement is not considered to be legally valid.

One type of arguments for informed consent refers to the patient's autonomy, basic human rights which are the correct thing to observe in medical attendance and treatment as well.

The other type of arguments only regard the usefulness of information to be important exclusively, and prove that patient willingness for co-operation increases after giving information and a joint decision.

There are three parts of informed consent:
- competence is stated
- communicating and understanding information
- agreement, voluntary authorization.

The nurse's duties in the process of informed consent

It is not the task of a nurse to move within the boundaries of the doctor's competence, that is to give information falling under doctors' competence, and take over responsibility concerning this. But it is her duty to respond to the patient's questions in certain cases. As the nurse is also responsible for attending to the patient, she cannot ignore the fact that the doctor missed informing the patient about the intervention. She has to tell the doctor at fault to give the necessary information to the patient.

There is a more severe solution in the United Kingdom. As Rozsos and Jakab put it, the nurse 'can decide not to co-operate in a procedure if she is convinced that the decision to agree to perform it was not based on real information and consultation'.

Nurses giving information to the patient:

Clinical decisions do not fall under nurses' competence, however numerous nursing interventions are known which require that the patient is properly informed. Nowadays patients are not satisfied with being treated, cured, they want to know what and why is done to them, this claim is a natural one that must be met.

General principles of healthcare worker behaviour

Healthcare ethics, nursing ethics

Bioethics is the systematic and rational study of ethical-moral issues raised by life sciences. Its multidisciplinary and dialogue methods are aimed at exploring and resolving conflicts of ethical nature.

Until the 1970s only medical ethics existed. Eliminating this privilege, bioethics was created and its fields are: the ethics of medical practice, the ethics of the system of healthcare attendance, the ethics of research as well as health policy and cultural bioethics.

With advanced science, technology, and through this advanced medical science, and the appearance of new procedures, interventions and their spread, it can be seen that the importance and complexity of ethical problems have increased (genetic research, organ transplantations).

General ethical principles as well as applied normative ethical principles apply to healthcare workers.A healthcare worker, as a person and member of society must meet the society's normative requirements, however, while working they cannot ignore their ethical principles and values which formed and developed through their own socialization and which arise from their personality and are connected with their objectives in life. They must also meet behavioural rules and norms. She must work in accordance with these in her everyday work, she must seek the most correct, the best solution for the arising ethical dilemmas.

When making moral decisions, nurse'smust take into account the ethical principles, patients' rights and guidelines of professional commitment. The problem has to be formulated according to the values, conflicts and conscience, and based on the gathered information and opinions, the decision has to be thought over, considered and carried out. The process is finished with evaluating the outcome and effect of the decision.

Becoming and being a nurse

To become a nurse does not only mean acquiring certain knowledge and skills, behavioural forms of certain situations, but also the mental constitution and system of values must be acquired, which causes a deep change in the persona-

lity, mentality and lifestyle of those concerned. Being a nurse means you act with rightful self-confidence and wisdom arising from acquired clinical and moral experience.

Nursing has a special role in the system of helping relationships. Those who have this occupation may be faced with all (somatical, psychic and social) problems of all fields of human life. An unsolved dilemma in modern healthcare provision is that the role of nursing has increased, however, the professional attitude has changed and the prestige of the nursing profession has decreased.

The transitory state of becoming a nurse, undertaking the nursing role

The first problem that would-be nurses face is the radical change which has to be made to the behaviour considered proper resulting from one's upbringing. Other people's body and life functions are no longer private but, because nursing needs have to be met, are considered an occupational duty. In many cases, nursing involves the patient's physical vulnerability, and until the would-be nurse is aware of this fact, nursing only remains a superficial activity. The most frequent cause of unsuccessful nursing behaviour can be found in the series of making ineffective impressions. Several times a series of failures, non-achievement leads to refusing, mechanic nursing activity. Those who choose nursing as their real calling sometimes should ask themselves why they behaved in a certain way, what the cause of their decision was, what would be more expedient next time. The basic requirement is obvious: special expertise, love of vocation and the ability to treat people with love and responsibility.

Nursing ethics

Nursing ethics is distinguished from medical ethics by aiming specifically at professional nursing activity. This special attendance gained independent rating directly next to healing medical activity.

The development of nursing ethics brings about the traditional moral principles along the line of bioethics and medical ethics, and it is faced with frequently occurring challenges in nursing practice and with problems of solving arising moral conflicts.

The history of nursing showed, and practice facilitated the maximum fulfilment of the patient's well-being to be the most important requirement in nursing.

The level of nursing education has significantly increased in nursing, especially in the past 20 years. After almost a century-long subordinate position within medical science, nursing has broken out of its modest position in health care.

Today nursing ethics is a separate discipline, it is not simply part of medical ethics. The prominent task of nursing ethics is to recognize and deal with the ethical problems arising in clinical and nursing situations.

The role of values and norms in nursing practice

What do I consider a value in my personal life?- is a fundamental question. Namely the individual's value definition is taken over by the community, and the value definition of different communities is taken over by society. Our behaviour is determined by norms and values, and a major role is played by them in evaluating the behaviour of others as well. Value is a base starting from which the significance or worth of something is considered, and the relative importance of different things or actions are considered. Values reflect the personal belief and attitude of a person towards disease, health, life and death. Values are, in actual fact, opinions about what is good or bad, right or wrong. These values are taken to any field of life. Existing values are: social, moral, material, aesthetic, ideological, religious, community values. Family represents a value, but for a healthcare worker saving life or support for sufferers or someone dying is also a value.

In nursing practice it is important to know the role of values, and not to enforce our own values on other people, patients and relatives but to try to understand these values and to manage the arising conflicts appropriately. The central value of the nursing vocation is provision for the patient. Provision and related values are ethically basic principles of the nursing vocation. According to the present approach, attendance to others is such a professional and personal value that can serve as a normative measure of nursing activity.Norms are written and unwritten rules of behaviour which set our behaviour in a particular situation. Norms are related to the rules of behaviour, while values are about opinions. The two concepts are closely related as opinions about good and right always have a role to play in behaviour. On the other hand, values usually become obvious through behaviour.Norms and values are connected to a specific culture and can vary from culture to culture. The same norms and values are connected to a specific time, and can vary with passing years. The change of values is represented by the fact that there is more talk about the patient's right to be informed, choose and make decisions independently.

The concept of value is closely connected and related to the definitions of attitude and norm. *Attitude* (disposition) conveys value, it expresses the individual's values, the system of values. General features of attitudes in an (even professional) group or community can be stated (using standardized measuring tools) on the basis of examination and standardization of individual attitudes.

Norms are social rules which maintain value. They have the function of controlling conduct and behaviour in a micro- or macro-community. They increase group cohesion, but at the same time they are requirements for the members of the community, through this they operate as a kind of 'code system' which helps the individual to make decisions (e.g. codes of ethics).

Activity – a carrier of moral value

Thus ethics evaluates an individual person's behaviour towards another person. Values, value judgements are opposed or set side by side in it. It examines what is good, right, bad, wrong, that is, what behaviour can be regarded ethical and unethical, or where the 'golden mean' lies. On basis of this one considers, compares the significance or worth of something and the importance of activities according to how we can judge them with regard to achieving our own objectives in life or possibly achieving the benefits for the whole of the society.

A person acts consciously in possession of his mental abilities. Moral value can be conveyed by *the result of action (its consequence), by the way of action (its tool) as well as by the intention of action (its motive).*

According to consequence ethics *(consequentialism),* direct or indirect moral value of actions is determined by the value of its result. Actions which are valuable cause valuable consequences, furthermore a consequence that results from an action that is not valuable can also be valuable. For example, a doctor may mislead his patient about the chances of recovery if this induces a more efficient healing.

The value of the result of an action can be the degree of its usefulness. The ethical principle of usefulness is emphasized by utilitarianism.The way of action is considered to be the carrier of moral value by the representatives of duty ethics *(deontology).* In terms of duty ethics, moral correctness of an action depends on whether moral rules are observed or not. Since the individual lives in a society, and the determining effect of social effects is not obviously prevalent, it is necessary to denote correct ways of actions in a normative (prescriptive) way. Thus in a normal society, the individual is expected to co-operate, that is the individual should act according to social norms, the prerequisite of which is the right moral awareness, the formation of the right conscience.

According to the approach of intention ethics *(intentionalism),* an intention can be considered good if the actor's inner (mental, emotional) state is good, right, and this is what motivates him to take action. However, this approach seems to fail when inner intention is opposed to socially accepted moral norms (for example the issue of euthanasia).Apart from human action, moral values can be conveyed by reason (thoughtfulness, consideration), will (e.g. divine) and feeling (well-meaning inclination, conscience) as well.

The connection between morals and religion

According to approaches of ethics as philosophy, there is relativism in which the different moral rules vary with situation and time, and there is absolutism in which, contrary to this, values are forever and universal.

With regard to this latter approach, the basic norms of moral theology are included in the Ten Commandments, which are about dedication to God and regulation of man's wordly life and actions.Living morally means one meets the social rules and behaves according to their own individual values. Internalization of values is called conscience (conscientia) in ethics. It can be considered a subjective measure of action. Conscience becomes mature through man's development and through conscious education. A possible way to form conscience according to Christian interpretation is praying. This spiritual approach demonstrates man's limits as well.

Conscience in its classical sense is the ability to unite conscious moral values with theoretical knowledge and with the experience of many years so that a person can look at things circumspectly before they acts.

There are two senses of moral conscience:

- according to one of the two interpretations, *habitual* conscience is meant by moral conscience.
- *current* conscience is meant by the other interpretation.

The human ability of moral conscience is denoted generally by habitual conscience, and it includes virtues, moral knowledge and wisdom.

Current conscience denotes a particular action of practical sense, a decision about morally good and about morally bad in a particular action which has been taken or is being taken.

It is important to make a distinction between ethics as a science and conscience. Current conscience does not mean that the primary principles are observed, or it cannot be identified as activities of practical sense, or it is not a way of solving new moral problems. However, conscience presupposes all these, that is why it is said that there is no conscience without knowledge. *Conscience is an act by which the requirements of human benefit become personal, and a particular situation is enlightened.* Moral conscience can be put as an intellectual act through which intention, decision and the whole act get a moral character. One uses his moral knowledge that he possesses in a particular case.

Accepted and internalized good qualities, skills are called *virtues.* Cleverness is considered to be the measure of other virtues. The starting point for the virtue of fairness is law. The virtue of courage enables man to stand up for truth bravely. The virtue of temperance holds up instinctive desires, emotions in a person.In the relationship between morals and religion, a personalistic approach can be seen, which emphasizes internalized values, virtues of man.

The connection between morals and the law

Morals and law cannot be separated. However, it is important to differentiate between them. Morals tells us how to act in order to do good, law tells us what not to do because if we do it, we will be punished.

The term *'natural law'* (jus naturale), created in the Antiquity, includes norms of fair and right actions which can

be recognized by natural sense and which regulate human social behaviour. It can be used as a synonym for law of nature, which refers to permanent unwritten norms of actions. Depending on the legislative will of particular societies, positive or statutory laws (statutory law, jus positivum) were created which ensure probability and predictability of social behaviour. Statutes created this way must be in harmony with known and accepted moral values, principles of society. Legal norms have been formed in accordance with customs and moral traditions. The fundamental goal of moral action is aimed at good, thus it is required from law to strive for goodness and fairness, which includes ethical principles and values prevalent through justice.

Formation of value and norm systems connected with the nursing profession

Nursing as an instinctive activity could already be seen in primitive societies as well. In modern age, the appearance of nursing as a vocation did not presuppose a nursing behaviour according to an internal norm system (wordly nurses). It was *Florence Nightingale* (1820-1910) who created and spread not only the basic rules of the profession (ensuring a clean bed, hygenic bath etc.) but also the values, the system of norms that can and have to be expected from nurses and nursing behaviour.

This was a milestone in the process of nursing becoming a profession, which in addition to meeting social regulation and system of norms valid for everybody, resulted in the emergence of nurses' self-assertion and their own internal values.

Zsuzsanna Meszlényiné Kossuth (1822–1854) was the pioneer in arranging for nursing education in Hungary, who recruited volunteer, caring and devoted hospital nurses to attend to the injured at the time of the war of independence of 1848–1849.

The value of nursing as a profession is enhanced by the fact that the responsible and autonomous healthcare worker with competences adequate to the special skill level performs her activities as an efficient and co-operating member of the healthcare team in order to solve the patient's problems, to satisfy his needs, to be in attendance for him, as a result of a systematic process, at every stage and level of healthcare observing professional and social norms as well as ethical principles.

Place and role of ethical codes of nurses in practice

A nurse's attitude to nursing depends on the nurse's own outlook on life and values, on their views on health, illness, healthcare itself and nursing. It should be noted that it is not only about the nurse as an individual but also the nursing community, the group, as common values have a group-forming and shaping effect. The nursing community works according to accepted behavioural values and a system of norms, consequently, a nurse

- respects human life, human dignity and human rights,
- attends to the individual irrespectively of his nationality, race, skin colour, age,
- gender, religious conviction, political orientation or social status,
- assumes responsibility for the performed activities and the people in her care,
- through continuous learning, her expertise is up-to-date, she does her work on this basis,
- co-operates with people and groups taking part in attendance in the interest of the
- patient,
- after professional consideration, she gives information about the patient to those entitled, exclusively in the interest of the patient.

Nursing as a profession has both ethical and legal aspects, which consist of standards stated in the fields of nursing practice, education and research.

The *code ot ethics* is a guideline, an official requirement which is related to the behaviour of those concerned, and it denotes the boundaries between accepted and prohibited behaviour, in addition it includes the standards fully accepted by the members of the profession.The purpose of codes of nursing ethics is to inform healthcare participants about the minimum standards of the profession, describe nursing duties, outline the main ethical principles of nursing, describe nursing behaviour as general guidelines, present the self-controlling functions of the profession, be reminders of responsibility assumed in healthcare.

The Code of Ethics of the American Nurses Association, the first regular code of ethics for nurses was published in the USA in 1950, it was last revised in 2001. The main emphasis in the present code consisting of 11 points is on responsibility of the nurse towards the patient, it is based on the individuals' convictions about society, health, nursing.

As a result of long developmental work, *the International Council of Nurses* accepted the ethical concept for nurses in Mexico City in 1973.

The code of ethics includes the ethical standards of the profession. In the code of ethics, instructions are given on how to solve moral issues arising in clinical and nursing situations. Its main chapters are: ethical concepts related to nursing, nurses and fellow beings, nurses and practice, nurses and the society, nurses and workmates, nurses and the profession. It was revised in 2000 and 2006.

The Code of Ethics of the International Council of Nurses served as a model for *the Code of Ethics of the Hungarian Nursing Association* founded in 1989. The goal of the *Health Ministry statute 30/2007 (22 July) about the Regulation for healthcare workers* is "to provide guidelines for healthcare workers by formulating the fundamental professional requirements about the rules of ethical behaviour to be followed with patients and the society and among themselves, and the acts that are rated as ethical fault."

The words in the Code of Ethics published by the Chamber of Hungarian Healthcare Professionals (MESZK) serve as model for the degree of honesty that can be required, and it makes it possible for those practising the profession to take action against those who are suspected to have violated the ethical norms.

Codes of ethics generally include ways of managing conflicts, its norms often exceed (may exceed) legal demands, but they can never be lower than those.

Preserving human dignity during medical attendance

Patients' rights regulate how citizens can exercise their human rights in the course of healthcare attendance. It clearly states what the individual using an institute can expect in a particular situation. It is not based on whether certain doctors and nurses behave correctly or do the opposite, but it regulates the relationship between the patient using the system and the institute.

Patients' rights are the sum of entitlements that a person using healthcare provision is entitled to have, irrespective of the fact that the person using provision uses it because he is ill or for other reasons. Every individual getting into contact with healthcare in any way is entitled to patients' rights to the same degree.

The 1997 CLIV Law on healthcare describes the right to human dignity in point (1) §10 in the following way: "In the course of healthcare provision, the patient's human dignity must be respected."As was stated by the Constitutional Court, human dignity "forms an inseparable unit with the right to life, which is inviolable and inalienable. Human life and dignity form an inseparable unit and are the highest value above all."The individual's human dignity and life are untouchable "irrespective of his physical and mental development or state and of how much and why that much he has achieved of his human potential."

During medical attendance, in consideration for the patient's sense of decency, his clothes can only be removed for the necessary time and to the professionally justified degree. A lot of ethical problems may arise during hospital care due to failing to observe privacy anddignity. The psychic burden caused by losing the usual environment, the sense of being vulnerable which is only increased by multi-bed wards, spare beds and corridor beds, should be alleviated. Examinations, treatments should be carried out completely in private excluding everybody who does not have to do anything with it directly.

It happens very often that the patient has to undress for the examination or intervention. If it is necessary and unavoidable to remove clothes, it is allowed to remove them only for the time of the examination and to the necessary degree, since exceeding this degree means violating the sense of decency or even human dignity. A gynaecological screening examination includes breast examination too, so all the clothes are needed to be taken off from the particular part of the body. A suitable and discreet environment must be ensured for medical examinations. This also means that apart from staff no other people should possibly be present at the examination. It is also possible that upon request nobody stays in the examination room apart from the doctor or chaperone. If the examination of the patient is carried out in a clinic of a medical university or a hospital in which there is training too, other person(s) may also be present at the examination for educational purposes, and it does not harm the patient's dignity, but the patient must be informed about this, possibly on the day of admission. The purpose of this regulation is for medical, nursing and physiotherapy students to acquire patient examination.

Human personal freedom must be respected during medical attendance as well. During the bed-bath of a bedbound patient maintaining hygiene needs has to be done in private with respect for personal rights as much as possible, isolation is necessary by means of a folding screen or curtain that can be drawn. The other important professional and of course ethical requirement is to observe the rules of asepsis and antisepsis, which can be required to be met whilst meeting hygiene needs(giving a wash, use of bedpan).

A person is responsible for and can be accountable for his acts, behaviour, intentions. One thing which must never be forgotten: the person is not the means but the goal. If these are not observed by nurses, healthcare professionals without fail, human dignity is violated. The most important ethical requirement for people: do not do anything to others that you do not wish for yourself.

Preserving human dignity of dying patients during care is as important as it is in other cases. Those who suffer from chronic, incurable diseases are entitled to mental care, attendance, alleviation of their pain and suffering until their death. Psycho-oncology operating within hospice provision can be very helpful in such a situation. The last offices are also part of human dignity despite the fact that it is not included in the law.

The rights to life and human dignity are absolute rights, thus they cannot be restricted. During healthcare attendance the right to human dignity is respected if during medical attendance we treat patients humanely.

Death is part of life. Death is not after life, it is an integral part of life, its fulfilment. We must respect life but we must respect death in the same way since it is very often an integral part of the medical and nursing job. The laws related to the profession are very consistent in this respect because they tell us that life and man must be respected. Unfortunately, respecting the former quite often makes us forget to respect the latter. Before we act we should examine what we should do and not what we can do. Since only those who have already seen and attended to a dying man with devoted love

and respect know really what is felt by those who prepare for death! Their face reflects servile humility, hope, anxiety, loneliness, their death shows the loneliness of their life, which they do not want to be aware of. From this point on we have to change our approach and do everything possible to make the end as peaceful as possible for the patient. Following through the dying man's dignified death should be done not because the rights included in the law must be fulfilled but because an inner power that we must have among our values tells us to do so.

Impersonality in healthcare provision

Impersonality is caused in the healthcare system by the fact that there are many patients in the care of doctors and nurses, many people deal with the patient but only for a short time due to division of labour. Another cause of impersonality is advanced healthcare technology, which often means a completely mechanical environment and treatment for the patient. A hospital is the place of human crises and suffering but it can also be the place where it is possible to solve them. Here humanity is not only an ethical requirement but also a factor of efficiency. Patients' requirements are not enough, the convictions of doctors and nurses are also necessary to create the surroundings in which it is really possible to cure patients appropriately.

We are not born with an interest in nursing. Our orientation towards this profession can be influenced by many factors. Gaining experience directly, the openness necessary to acquire the roles, a well-qualified mentor or teacher who passes over a kind of clinical approach and decision-making skill all have a crucial role in young people starting out a career becoming a good professional. In healthcare there is a strong tendency of labour force migration and quitting, which generates lower quality nursing staff. Thus in many cases it is a constraint to employ people almost 'from the street', from the production line, people who were recognized in their work have to change their career and work with the sick after receiving minimal or no retraining because they have lost their job. The lack of professional, psychological, ethical and emphatic skills is felt in their everyday work.

A patient staying in hospital also has a wish for communication, keeping in contact, understanding and help, which in many cases can only be ensured by his loved ones and relatives, because the environment where they stay at a given time does not provide this for them. Many of them suffer because they have lost their independence, they cannot wash or eat on their own, or cannot meet other hygien needs either. The wish to be respected has an important role for the patient. Addressing him, regard for physical and psychic intimate spheres belong to respect. The nurse should not give an injection mechanically, not saying a word to the patient, she should not feed the hungry patient automatically or apathetically just because there is still a lot of work to do. A nurse has to talk to every patient, so that he cannot feel neglected or feel that his human dignity is violated. Interpersonal relations between patient and nurse are fundemental factors which essentially determine the improvement of the patient's emotional and physical state.

Nursing ethical problems of special cases – Ethical issues connected with patients' treatment

The freedom of conscience as a patient right

In the case of an old man turning down dialysis treatment because he got tired physically and psychologically of the weekly dialysis treatments – can the right to support his intention be exercised? According to the CLIV law on healthcare, § 20 (3) "A patient capable of acting can only refuse life-saving, life-sustaining treatment if he suffers from a disease that could lead to death even if adequately treated". If this condition is not met, the patient has to be treated even against his will. In the case mentioned before, the patient refused to have regular dialysis treatments. A dialysis treatment is qualified as life-sustaining treatment, with appropriate treatment the patient can live for several years, but the question is what life quality is that? By that it is not adequate clinical and laboratory parameters that are meant but the permanent constraint which makes him be on stand-by constantly. Thus in terms of Hungarian law, in the case used as an example the patient's decision is irrelevant, he must be treated even if he refuses treatment.

Issues related to transfusion

In modern medical science there is a widespread use of transfusion as an efficient therapy, although complications may arise during and after the treatment. The use of transfusional therapy must be based on the informed consent of the patient. In consideration of the basic right to human dignity, the patient can decide to refuse blood transfusion too in protection of his personality, for which the religious conviction of Jehovah's Witnesses is a good example.

Principles of Jehovah's Witnesses in connection with health and healthcare provision.

The community requires its members to observe strict principles, among other things it prohibits abortion, infant baptism, smoking, participating in wars and military service as well as in politics. Furthermore, it regards homosexuality a severe sin.

They refrain from blood, this means they do not take any other man's blood into their body, not even their own blood after it has been stored (autotransfusion).

With regard to the law, patients are willing to sign the form of American Medical Association. Its Hungarian equivalent is the "Document related to medical attendance", a card dated and attested by two witnesses that is made in agreement with healthcare and legal authorities. This document is in fact the disposal of the patient, and an exemption for the hospital and the doctor from health damage caused by refusing blood.

What happens when the Witness receives blood transfusion against his will? Such a situation causes a very severe psychological trauma for the patient, and since the grounds for the Bible is love, of course other believers will prove their firm supporting behaviour.

The most frequently debated issue, both theoretically and practically, is of course the case of the decapacitated and partially decapacitated patient, most often underage or underfourteenWitness. However, analysis of the law in effect showed that in this case the right to refuse cannot be exercised, the Witness parent cannot have a say in the use of blood transfusion, the only ecxeption is when a life-sustaining intervention is applied in the case of a disease in natural course.

If a parent belonging to Jehovah's Witnesses refuses to allow his underage child to receive life-saving blood transfusion or a pregnant woman before childbirth refuses to get life-saving transfusion, it is usually ordered to use life-saving transfusion even against the parent's will if the unborn or underage child's life is threatened because of religious conviction. The child has the right to live just like an adult does.

Other topics in bioethics

Bioethics is a discipline which deals with the ethical issues of life sciences (biology and medical scinece). It has two main branches: one emerged from medical and healthcare ethics, the other deals with the ethical issues of environmental protection. Bioethics deals with problems such as the beginning and the end of human life, connected to this, abortion, artificial insemination, gene therapy, organ transplantation, euthanasia, which are not only medical ethical problems any more.

Sanctity of life and quality of life

Sanctity and inviolabilty of life are related concepts. Human life and health are values which have to be protected, sustained, extended as much as possible. Recognizing the value of human dignity has an effect on the individual and the community.

"Living Will or Life Passport"!

In the Living Will (Advance Directives) a person disposes his advanced wishes if he should become unconscious and cannot express his will.

In the Living Will the patient with capacity is entitled to refuse treatment except when omission of treatment endangers other people's life or good health. The patient can only refuse treatment, which probably results in severe or permanent health damage in his health condition, in a notarial document or in a private document representing conclusive evidence, or, if he is unable to write, in the presence of two witnesses. In order to allow for the disease to take a natural course, the refusal of life-sustaining or life-saving intervention is only possible if the patient suffers from a severe disease which, incurable according to up-to-date medicine, leads to death in a short time even if it is appropriately treated. The refusal of life-sustaining or life-saving intervention is only valid if a board of three doctors has examined the patient, and declares unanimously in a written form that the patient was aware of the consequences of his decision, and the above mentioned conditions are met, in addition, the patient on the third day after the board's statement – in the presence of two witnesses – expresses his intention to refuse again. A Living Will cannot be made by a pregnant woman, and it will be invalidated if a woman becomes pregnant any time after making the Living Will.

The issue of euthanasia

Euthanasia (Greek eu = good, easy, thanosz = death) refers to the act of ending, or deliberately shortening the suffering incurable patient's life in accordance with his expressed wish. It has two basic forms. One is active (it is also called mercy killing) through which the incurable patient is assisted to death either by ending his life on mercy or assisting in suicide.

Passive euthanasia or letting someone die is the merciful non-use, omission of life-extending activities, and letting the incurable patient die in order to shorten suffering. This form of euthanasia may also include an action such as omission of resuscitation. In Hungarian law neither active nor passive euthanasia is allowed.

Foreign practice

Legal determination of euthanasia by way of a few examples

In Europe, active euthanasia is only allowed by national law in The Netherlands and Belgium. This law was passed by the Parliament in The Netherlands in December 2000, but it had not been punished beforethis date. The patient has to request it in a written form. The intervention is only justified for unbearable lethal diseases that cannot be soothed and after all other therapies have failed. The expert opinion must be approved by two doctors independently of each other. Approximately 3500 people die assisted by a doctor in The Netherlands every year, but there are many more applicants.

Hungary

None of the forms of euthanasia was possible in Hungary until 1997. The doctors' duties are described in the 1972 Law on Healthcare, §43.2:

"The doctor must take the measures that are necessary to prevent illnesses, to save the patient's life and cure him with the utmost care and circumspection. The doctor must also treat the patient whom he considers to be incurable with the utmost care."

End-of-life decisions on therapy are distinguished *in terms of their goal*. Using the definition of the Hungarian Chamber of Doctors and a collective term, only such an action or non-action is euthanasia the goal of which is to shorten or end the life of a suffering fellow-being in his interest, out of mercy. There is a list of end-of-life decisions which are not rated as passive euthanasia: withdrawal of treatment and life-sustaining procedures that have becomeineffective, letting the patient go, contraindication of escalating the therapy, use of palliative therapy, treatment alleviating suffering, compromise medicine, considering the indication to resuscitate, and the choice of a cost-effective therapy. In connection with this, Blasszauer in one of his articles in 2008 debates the entitlement of the doctoral oath, he states that "the thousand-year-old oath, for example, prohibits abortion, doctor-assisted suicide, yet both actions are legal in numerous countries."

Recently a Belgian study aroused vivid interest in professional circles. It was published in the British Medical Journal (BMJ) in April 2008, and it made knowledgeable researchers of the subject and participants take an active side. The authors of the study make an effort to merge the issues of euthanasia and palliative therapy referring to the same ethical values that they are based on, namely on the autonomy of the patient concerned and on the beneficence and 'do not harm' principles which are followed by the attending staff.

According to the position taken up by the Hungarian Hospice-Palliative Association, with more and more improved palliative therapies there is no justification for euthanasia.

Opinions and attitudes of nurses in connection with euthanasia and end-of-life provision

In a lot of research, nurses mentioned it as a basic principle that euthanasia is irreconciable with nursing practice.By looking at the literature available, it can be seen that nurses' opinions vary about end-of-life (EOL) provision. Intensive nurses' involvement in EOL-nursing related decisions and the degree to which belief, experience and attitude is prevalent in nursing practice were examined in a study.

The objective of the study was to reveal EOL related experience and attitudes of intensive special nurses in Europe. There were differing views about the following: 44% agree that dying patients have to be deeply sedated and to the same degree they disagree with continuation of feeding (41.6% vs 42.3%).

The authors of the article emphasized in their conclusion that the opinions and experience of intensive care nurses in Europe were generally similar about EOL provision, except for feeding and sedation about which the views were different. However, they had similar views concerning the confidence and role of nurses in EOL decisions which can be enhanced by official guidelines and training.

Relations between religion, world view and euthanasia were analyzed in many comparative international studies, and publications support the hypothesis that nurses' attitudes to euthanasia are influenced by their religion and ideology.

Ethical issues concerning 'do-not-resuscitate' decisions

In the course of this decision, the staff has to omit resuscitation (ensuring circulation, breathing). The decision not to resuscitate often occurs in intensive care units. This already presents an ethical problem, namely the one that says the primary goal of attendance is sustaining life.

In Chang, Huang and Lin's study (2010), patient groups were compared in terms of making or not-making the DNR decision statement in two intensive care units. Regarding the total number of patients (N=202) taking part in the examination, the rate of the DNR decisions made was 65.8%. It has been shown that the therapist induced the decision in 72.9% of the cases, and only 1.5% of the patients initiated the decision. According to the study, old age, unmarried family status, an adult child as a substitute decision-maker (80.5%), unconsciousness (88.7%) have a significant consideration in DNR decisions. In slightly more than half of the cases (51.3%), the DNR decision was made less than a day before the patient's death (63). According to the findings of a larger scale European research study, the limitation of the life-sustaining treatment was taken three days after admission to the intensive care unit on average.

Personal attitudes and earlier experiences of family members and doctors also influence the decision-making process when the DNR decision is made.

It arises as an ethical dilemma for the nurses whether the patients whose DNR decision has already been made receive the same treatment or not.

Ethical dilemmas in nursing

Until the 19th century doctors relied on intuition, experience and creativity, they were not considered practising healers who use scientific activity, concrete theoretical knowledge. In their work, an outstanding role was attributed to the importance of establishing interpersonal relations with patients, resulting from which behavioural culture was practised on a very high level. Later, with technical and scientific development, professionalism got prominence, and behavioural and relationship factors were pushed to the background. This process started later in the field of nursing. In biomedical healtcare, relational and behavioural phenomena could not compete with the development and achievements of science, due to which healthcare provision became impersonal.

Nowadays, in holistic bio-psycho-social healthcare, connecting relations are appreciated. These well-being factors appear as important factors in developing, running and therapy of illnesses. The doctors' and nurses' task is not only cure and attention to the disease but also to the sick person. However, this can only result from interpersonal relations, in which doctors and nurses are also active participants with the whole of their personality, behaviour and emotions.

Healthcare has become multi-participant. The nurse, a new participant appeared in the traditional doctor-patient relation and later after medicalization and with advanced hospital attendance other members of a team (e.g. physiotherapist, dietician, operating room staff) joined in medical attendance. The patient, depending on his condition, appears in different fields of healthcare provision, thus several teams take part in his care, and this needs co-ordination.

Within this complex healthcare context, traditional nursing roles have gained importance. Nursing education has changed, expanded, but also has become specialized resulting in a hierarchical rating of the profession on the basis of acquired knowledge, abilities and skills. According to the acquired qualification, different responsibility relations have emerged. Responsibility and in this way decisional autonomy have increased concerning nursing interventions, the nursing process (survey, planning, implementation, evaluation).

The essence of ethical nursing behaviour is responsibility, which is a complex concept including responsibility for their own work, for the work in the attending team, as well as decisional responsibility and representation of the patients, and actionable conduct.

1. Ethical independence (autonomy) includes the dimensions of personality, self-esteem and ethical reliability. Apart from carrying out activities of the nursing profession, independence also appears in observing the patients' autonomy. The responsibilities assumed in the nursing activities may be :
   - personal responsibility the prerequisite of which is the maturity of the nurse to perform the task, as well as the voluntarily assumed behaviour, work;
   - competency which is determined by its adequacy to abilities;
   - professional responsibility which means adequacy to professional guidelines;
   - legal responsibility which requires adequacy to civil, labour and criminal law, and
   - ethical responsibility which influences the nurse's responsibility by means of written (code of ethics) and unwritten rules (conscience).
2. In professional terms, the nurse performs her work following the doctor's instructions and in accordance with professional standards. However, it is her ethical duty to protect the patients' right to self-determination, representing the patients' rights.
3. As a consequence of her responsibility, the nurse can be held accountable because of her professional role, and actionable conduct is possible in the case of ethical faults. Of course, if the nurse commits a professional fault according to her own ethical judgement, which endangers the patient, she is accountable.

Autonomy is in fact nothing but respect for the other person's (the patient's) thinking, that is, acceptance of the fact that the other person (the patient) can make decisions according to the frame of references available to him. Autonomy and respect for the individual means ensuring the individual's self-determination even in a case when it is dangerous for him. It is very difficult to provide this in emergency and intensive care units, in such cases when the patient temporarily loses his autonomy, his responsibility to make decisions.

Ethical dilemmas are brought on by taking over the responsibility or the possibility of taking over the responsibility to make decisions in the case of sick children, comatose patients, severely mentally disabled and psychiatric patients.

Examples

Decision-making of children

The most commonly accepted basic principle of bioethics is respect for and protection of the patient's right to self-determination. The patient's self-determination covers all healthcare interventions concerning him. Informed consent is necessary to interventions.

In the case of children, as they have no capacity according to the operative law, the legal representative exercises the child's rights. Thus legally the parent can make all sorts of healthcare statements of rights on behalf of and in the interest of the child.

In the case of children, prominent ethical dillemas are the issues relating to the attendance to incurable children and alleviation of pain. Children also have experiences of pain.

In recent years the definition of a worthy life has spread, which puts forward the importance of *quality of life gained*. It is essentially the patient's judgement of his own condition and anticipated prospects. It is important to emphasize that the child's best interest and opinion must be taken into account in accordance with his age. A worthy life can mean different concepts to different people. The best interest of the child – considered the best by the doctor – can considerably limit the parent's right of determination in certain cases.

Traditionally, in the case of children, parents and doctors, nurses take part in making the decisions. That is why conflicts may occur between substitute decision-makers (parents and professional groups) in order to ensure the 'best interest' of the child. However, nowadays children's cognitive development is taken into account and they are getting a more and more active role in the decisions concerning them.

Nurses are faced with a complex ethical challenge when protecting the diseased child's interests. In intensive care units or paediatric oncology departments as places for the treatment of incurable, dying children, accentuated tasks are symptomatic treatment, joint decision-making, efficient communication between the patient and the family members, continuity of provision and support for the family.

Ethical issues of organ and tissue transplantation

With the very rapid technological development, the number of organ transplantations has increased, however, there are few donated organs to meet the increasing needs. This generates continuous legal and ethical problems.

In the course of 'live donation' (organ transplantation from a living donor), special circumspection is required with informed consent, the possible complications must particularly be included in the information given since the donor might even risk his life. Organ transplantation has to be voluntary, free from any influence, in the meantime it is very difficult to judge but also avoid the psychic pressure from the members of the family. In order to prevent abuse, it is important for organ donation to be free.

Nowadays there are two accepted forms of organ removal from dead bodies:

- In the system of 'opting out' the lack of refusal, that is the presumed consent makes it possible for organs to be removed at any time from the suitable body, except for the case when the individual disposed otherwise when still alive.
- In the system of 'opting in' the individual in his life makes a written statement (e.g. donor card) in which he determines how his organs must be handled after his death.

In Belgium, just like in our country, 'presumed consent' was included in the law. According to the law, 98% of the Belgian population are potential donors, and healthcare providers are not obliged legally to inform the relatives about the donation. However, the law is incompatible with bioethical basic principles, and with the individual's right to free disposal about their body after death as well.

Transplantation of organs and tissue removed from cadavers (dead human bodies):

With respect to consent given to organ and tissue removal from a dead body, there are three systems in bioethics and legislation:

- The principle of positive consent means that such an intervention can only be performed if the individual stated his agreement when still alive.
- According to the principle of consent from relatives, if the donor did not make a statement of refusal in his life, the relatives can decide about the removal of organs or tissue.
- On the basis of the principle of presumed consent, if the person did not make a statement in his life, the consent is presumed by the law, thus he can be considered a potential donor.

In the case of the underage this is not possible, therefore the legal representative is required to make a written agreement.

In the case of an underage donor, the law is the same elsewhere in the world: the parent, the guardian, the legal representative needs to give their consent to organ removal. This raises a new ethical question: is it completely acceptable in ethical terms if a relative who is not related by blood to the underage child has to make the decision?

It is known that the issue of organ and tissue transplantation is not only about determination of the time of death, since here there are not only dead but also live donors, let alone the patient who receives the organ, who just like the donor has personality rights and dignity, and who also has to prepare for living with someone else's kidney, liver, heart, pancreas, bone marrow etc., similarly to those who decide to donate some organ for medical science for therapeutic purpose. Furthermore, self-assessment, self-image, change in personality – which do not remain intact during such an intervention – of the patient concerned in organ transplantation could be the subject of an ethical examination. However, it can happen that the patient refuses organ transplantation, but his decision must be respected. This decision is not a decision against the dignity of life or idolizing the dignity of death.

Psychological antecedents and moral effects of transplantation

Some patients wait for a suitable organ for years. The tension and anxiety of waiting and preparation are usually not dealt with because they are swept by the reality of the performed transplantation. It is a severe psychic strain on the patient to accept the fact that someone's death is necessary for him to be able to survive. It would be a natural emotional response to refuse, since if we only think of general morality, this fact is really unacceptable instinctively, and in many cases this is what happens. It would be important to go over this issue in a way that his sense of responsibility and guilt diminishes. He has to accept psychically and morally that this is the only way he can survive. However, these thoughts remain, are kindled later too since he lives with another man's organ. In spite of the fact that many times the donor remains largely unknown in reality, he is partially outlined in the recipient personality's conscious and unconscious imagination as a regular psychic phenomenon.

It is not enough to replace the old diseased organ with another one, the patient must accept the change mentally too. Without parting and mourning there is no real space for the new organ. The patient has to accept the new organ as a present, and in this way integrate it into his own body. One is faced with new challenges in his after-transplantation life.

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9. The Complexity of Lossand Death in the Course of Human Life

BY ILONA PÁLFINÉ PH.D. SZABÓ, MIKLÓS LUKÁCS

Introduction

During the practice of their profession physicians, nurses and health care professionals continually come across patients and family members having suffered from loss. Concepts and theoretical and practical knowledge related to loss and bereavement serve as a useful frame during nursing. While being in contact and collaboration with patients and their families this helps nurses to create an atmosphere in the given environment where the people involved can have a chance of expressing their physical, spiritual and social pain. Supporting patients and their families, listening to and understanding them, respecting their value system, taking their convictions and wishes into consideration are all pillars of cardinal importance in nursing. A relationship which is based on trust creates such a therapeutic atmosphere that facilitates processing loss and bereavement and strengthens the dignity of patients and their families and increases their self-respect. In the course of the care of mourning or dying patients and their families the understanding behaviour of nurses contributes to the philantropical overcoming of difficulties. These are of crucial importance in hospice care. In palliative care it is increasingly seen that it is not sufficient to eliminate and reduce the patient's symptoms but holistic, individualized care must be sought. The hospice model should include the somatic, psychosocial and spiritual needs during the disease and in the period of mourning as well. Caring for dying patients and their families at such a level is a difficult task for everyone. The servant of Ivan Ilyich understood that in such cases, the dedicated presence, positive reinforcement, compassion, and countless tiny gestures may mean comfort for the patient and the family. These implications of nursing are recently described with the help of concepts such as the intellect, purpose, dignity, and spiritual or existential well-being.

About Loss, Death and Dying

Our culture on death is changing, and although it relies on traditions, customs and rituals for shorter or longer periods of time, it has to meet such fundamentally different and new challenges which require the elaboration of the death and bereavement culture suitable for the era and a changed approach to life. Loss and death are general, yet unique experiences of human life. In our culture death is difficult to process not only for the dying person, but also for his family, friends, his fellow-patients, and the nursing staff may be touched by it deeply, too. The majority of nurses encounter people and families having experienced a loss on a daily basis. For nurses it is often easier to relieve the physical pain of the dying than mitigating their spiritual sufferings upon creating a close contact with them. They require self-awareness revealing their personal attitudes, values and feelings necessary to be able to establish attentive therapeutic relationships with patients. The person supportingthe mourning needs a professional self-image and internal strength based onknowledge of one's self. Loss is a multi-faceted concept. It can have real, pre-emptive, symbolic and imaginary reasons. The process of dying is a good example for real and pre-emptive loss both from the point of view of the dying person and also the one close to him. The experience of loss is created by experiencing the lack of or losing an earlier possessed object, part of body, function of the body, emotion, idea or persons.

It is not commonly understood that we need to work on bereavement not only after a loss caused by death but in every other case as well, for example when a period of life is shut down. The way we experience our losses, how and when the grief felt about our loss ends depends on countless things, like our age, gender, our preparedness for loss, our crisis solving repertoire, our crisis handling skills, on the supportive environment. Naturally the degree of how individually trained we are by our losses is also a determining factor.

The disappearance or cease of every such thing that used to be significant for the individual in a physical, emotional or psychological aspect causes a feeling of loss for human beings. This is a subjective experience, it means something different for every single individual. During our lifetime we do have to make efforts in order to be able to adapt to life and live together with its painful changes, the various sorts of losses. Although the loss of an important person is primarily meant by loss, it is crucial that we are capable of seeing a much wider range of events as experiences of loss. Numerous research materials are available concerning the relationship to loss and death. According to the early examinations of Bromberg and Schilder 50% of people deal with the question of death in thought which is generally connected to some kind of topical event. Cameron found that 59% of the examined persons dealt with death in thought. Upon interviewing 14,000

people Cappon found that 11.3% of the subjects thought of death once a week and 35.4% of them dealt with this question rarely or never. Among the people examined by Schneidman 22% thought of death at least once a day, 57% occasionally and 21% just very rarely. Several authors emphasized in their studies that old people are expressly often concerned by the thought of death. Singer and his colleagues determined that the following issues are of concern to patients approaching death. Primarily, access to pain relief and to adequate treatments for the symptoms, the avoidance of undue delays of dying, to be ensured a sense of control, to be liberated from psychological burdens and deepening relationships with their beloved ones.

It has been shown upon testing 100 Hungarian persons that women's fear of death is bigger, men tend to relate to death in an emotionless manner or with neutral acceptance, in the age group 31 to 50 fear of death was higher, the aspiration to avoid the thought of death was more prevalent among people who were religious to a medium degree than to highly religious persons, and deeply religious people feel death to be more like a gateway leading to a happy afterlife than a terrifying event. The studies performed among healthcare workers have shown that they have little knowledge about death and dying. The deficiencies in their knowledge, their own fears about transience, their denials may have a negative impact on their relationship with the dying, they generally have negative attitudes about dying and several of them try to avoid dealing with issues disturbing the dying.

What does it mean to die? This question has been asked as long as human beings exist. Although even if there is undoubtedly a growing interest about this topic, it is true that most people are not in favour of talking about death. It has two reasons; one of them being of psychological and cultural nature, namely that the topic of death is a taboo. Maybe this feeling lives in us unconsciously when we get in touch with death, even if only in an indirect way, we think of our own death that will occur sooner or later. Let us think it over how a patient treated at an outpatient's department or at an intensive care unit dies. He is alone, isolated, separated by folding screens, has different tubes, probes in his mouth and nose, there are catheters etc. in his body, he is monitored. What sort of quality life can be ensured under such circumstances? Following our birth and life our death has also been objectified, it has become routine-like and mechanical. Our hospitals are cold, rigid and unhomelike where 33,000 patients with tumorous diseases are treated, nursed and dying. In these institutions the care of dead people happens according to predetermined rules and routine-like processes that include filling in forms, isolating the dead, tying foot labels on them, 'wrapping' them into dead body bags, transporting them and then disinfecting their environment and dissecting them. The rituals of dying, the dignity of death, the respect of bereavement have been lost, our funerals are like events on a production line, stereotyped, our cemeteries are like concrete jungles. Refraining from this topic is also psychologically understandable in the same way. While getting involved in a conversation about death a lot of people have the feeling that if they have psychologically evoked death, then they are somehow compelled to think of their own death as being unavoidable. Since we want to protect ourselves from this injury, we simply try to close our ears and avoid the whole topic.

In Western type societies, including Hungary, the attribute of biomedicine has become dominant, namely the desire to heal the patient in any possible way, i.e. if a patient cannot be healed, health care and the medical team considers it as a failure of cure. Due to the spread of the view that perceives death as a failure of healing, death is not a natural process any longer, it is not an organic part of the full cycle of life any more but it is unnecessarily wrong that we endeavour to eliminate or at least push as far as possible. Partly as a result of medicalization the fear of death has increased in an unreal way and it took an irrational form in which the phenomenon of hospitalization which takes the dying out of their community and actualizes their concealment plays a role and all of these are possible reasons which have led to the present situation. Most people, if they do nothave direct experience of loss , think of death as an event of the far away future which has no relevance of any kind in the present. The belief that death is unconceivably far away equals the denial of death.

About Grief

The manifestation of pain and sorrow felt due to death and loss is called a reaction of bereavement which is under normal circumstances followed by the processing of loss, the bereavement work. Palliative care includes the support of the family and other close acquaintances who take care of the patient during the course of the disease, their preparation for loss and the support of the mourners after the death of the patient if needed. The support of the bereaved is an organic part of palliative care. The bereavement risk-survey in connection with the patient and his family is an everyday, personalized and continuous activity during the course of life-threatening diseases. In this process the questions of loss and bereavement have to be dealt with. After the death of the patient the services supporting the mourners have to be made available for the family and follow-up is also necessary. Demographic and cultural factors in case of reactions of bereavement are: the most serious loss is the bereavement over the death of a spouse or a child. The disintegration of the world model lasts longer after losing a husband or a wife, whereas the loss of a child evokes the most intensive and the longest lasting inner pain and anger. This reaction appears in a more pronounced way with mothers; they express painful feelings more openly and request help more often than men do. The level of despair or depression observed in case of women in general in the first year of bereavement decreases faster than in case of

married or widowed women. Death caused by heart disease following a spouse's death is a larger risk factor in case of men than with women, which can be explained by the suppression and prohibition of bereavement. In terms of age the bereavement work is more complicated in case of elder children, where appropriate communication bears great significance. Adults conceal reality, they prohibit children to talk about death. In case of the elderly, withdrawal from social interactions, whereas with adults the search for new social relationships is to be emphasized. In relation to religion every known society allows crying during bereavement but there is an extraordinary diversity in its degree. This means a slow liberation from the grief and bereavement caused by loss in such a way and with such a result that we become able to live an open life, turning towards new relationships and opportunities without the one we have lost. For this purpose it is necessary to take care of proper bereavement work, which means a change of life style, the liquidation and transformation of common activities, places, objects and emotions and also the acceptance of the modified reality. The classical works of Engel (1964), Kübler-Ross (1969) and Martocchio (1985) offer the frames for the interpretation of the concept and dynamics of bereavement. The process of experiencing and dissolving bereavement is broken up to phases by each author.

The success of working on bereavement depends on three factors:

- detachment, disengagement from the strong ties related to the deceased person
- accepting life without the deceased, adapting to the current situation
- building new relationships

The individual responses to death can be as follows:

- normal bereavement reaction
- pathological bereavement reaction, prolonged emotional crisis due to maladaptive behavioural patterns
- regressive reaction (depression, suicide)

Pilling (2001) simultaneously shows in his writings presenting the psychological process of mourning the distinct phases, their transitions and the continuous changes. This model includes the following stages: the first one is the anticipational bereavement, the second one is shock, the third one is the controlled phase, awareness is the fourth stage, the fifth one is reconstruction and finally there is adaptation.

In the article *Symptoms of Grief* by Kathryn Patricelli MA, edited by Mark Dombeck Ph.D. (2004) the expert who deals with the symptoms of grief describes that every person's grief is unique but there are common behavioural, emotional and physical signs and symptoms as listed below.

The physical symptoms are: the time periods that go with tiredness and exhaustion alternate, temporary hearing or visual impairment, sleep disorders, disturbed appetite (either bigger or lesser than normal appetite), muscular tremor, shivers and/or sweating, dyspnoea or rapid breathing, increased pulse rate and blood pressure, problems of the stomach and/or of the intestinal system, nausea and/or dizziness.

The psychological signs are: **c**onfusion (memory, concentration, judgement and understanding difficulties), **i**nvasion (undesired thoughts, waking up, nightmares).

The emotional signs are: shock, fears, anxiety or worries, anger, iritability, excitability, guilt, numbness.

After the loss of a husband or a wife about one third of the surviving spouses suffer due to the decline of physical or psychological health. Loss of appetite, sleeping and concentration disorders and disturbed emotional life are common in the first month, in the immune system the decreased functioning of the lymphocytes can be observed. Great losses contribute to the development of certain types of cancer and the number of male patients with heart disease over the age of 55 is outstanding. Widows and widowers over 60 years of age complain about bone and muscular pain. Depression was diagnosed in 47% of elderly widows in the first year of bereavement, the number of suicide occurences also increased. Hypochondria, repeating the disease of the person who has diedalso occurs.

Chart 1 Theories on processing bereavement

Engel (1964)	Kübler-Ross, E. (1969)	Martocchio (1985)
Stagies of grief		
• being heart-stricken, disbelief • regression • reorganization and re-establishment	• denial • anger • bargaining • depression • acceptance	• being heart-stricken, disbelief, protest • longing to leave • anguish • collapse • despair • identification with bereavement • reconstruction and re-establishment

Approaches to Pallative Care / Hospice

Background

In Latin the word *'hospicium'* meant hospitality, treating someone to a meal but it also meant accommodation or a hotel. In the Middle Ages the expression 'hospice' was used for the shelters set up for pilgrims and travellers and later it was applied for the institutions established for the care of patients suffering from incurable diseases and being at an advanced stage. The concept of hospice involves a special kind of mentality, services and organizational system. The essence of hospice mentality is living together with the dying, getting the dying involved in the life of a community and ensuring an environment and circumstances that enable the dying person to use and enjoy his remaining mental and physical skills. The patient stands in the focus of the life of the community and he gets medical, nursing, spiritual and social support and care on the highest possible level.

Hospice means the humane, complex care of patients undergoing the final stages of their severe disease with the help of multidisciplinary groups, whose life expectancy is less than 6 months. In 1990, 145,660 people died, in 2007, 132,938 people, in 2009, 130,414 people, 32,500 of them in cancer. From this group of patients about 6500 received hospice care, which is 20% of the 32,500 people who died of cancer in Hungary. According to a survey conducted by the Hungarian Hospice-Palliative Association (www.hospice.hu) in 2010, hospice coordination was carried out in 78 patient care institutions and residential care facilities, in 11 hospice inpatient departments (171 beds), at 62 hospice home care service providers, in 2 nursing institutions, and respectively, in nursing homes hospice type care was provided (15 beds) and within the framework of three mobile hospice teams (of a hospital support group). The inpatient departments provided care for 2025 hospice patients, the home hospice services for 3861, the mobile teams for 23 and the outpatient departments for 587 hospice patients. The total number of days with hospice care was 120,014. The proportion of patients with cancer was 91.7%, the average time of care was 41 days, the bed occupancy was 79% in the inpatient units, the mortality rate was 74.2% and the rate of patients who died at home was 38%. It was typical of the patients' age distribution that compared to the previous years, younger patients were admitted to hospice care, namely patients aged 61 to 70, whereas during the previous years the age group of 71 to 80 was predominant. The percentage distribution of home hospice care is 58.9%, sustained pain relief is 21.2%, therapeutic gymnastics is 3.9%, physiotherapy is 0.4%, social activities constitute 2%, dietary care is 1.7%, mental hygienic activity is 2.7 %, medication, palliative therapy (medical activity) 9%. Unfortunately, these rates still do not reflect the complexity of hospice care, compared to the previous year, in all areas of activity other than nursing, stagnation or a minor decrease can be observed.

The purpose of this care is improving the patients' quality of life, mitigating their physical and psychological suffering, supporting their physical and mental activity and helping the relatives endure the burdens of disease and bereavement. Doctors, nurses, physicotherapists, psychologists, mental hygienists, social workers, clergymen, nutritionists and qualified volunteers participate in this type of care. This way the members of the work team can provide complex (physical, psychological, social and spiritual) multidisciplinary support.

Dame Cicely Saunders was the initiator of the modern hospice movement, who opened the first residential hospice ward, St. Christopher's Hospice in 1967, where she herself also died at the age of 87. In Hungary Alaine Polcz introduced patients' care with a hospice approach in 1991. The Hungarian Hospice Association was established on 25 March 1995, which laid down the statutory goals of its operation. Balfour Mount encountered a problem with terminology in 1975, when looking for a name for his new inpatient ward, because Canada's French-speaking inhabitants used the word "hospice" in another sense. This was how the term "palliative care" was launched.

Palliative care is the totality of supportive treatments oriented towards mitigating the symptoms of patients in a terminal stage. The word originates from Latin, *pallio, palliare,* meaning to cloak, to mitigate, to protect; *pallium,* cloak. Palliative care includes all the applications of the appropriate palliative interventions, among which disease modifying therapies like surgery, radiation, chemotherapy and hormonal treatments etc. can also be found. The final target of these interventions is achieving the best possible quality of life. Due to this, it is of vital importance that palliative care programmes completely integrate into the existing health care programmes functioning in hospitals and communities.

Palliative medicine is professional care within the frame of which the therapeutical approach of any branch of medical science is applicable (medicinal treatment, surgery, chemotherapy, radiation therapy, hormonal therapy, immunotherapy) with the purpose to ensure the physical and psycho-social well-being of people suffering from terminal diseases. Its target is not curing but securing the achievable best quality of life. During both the process of the disease and the time period following death the problems and the demands of the relatives have to be taken into consideration and if necessary the therapy has to be extended to their problems, too. According to the definition issued by the WHO in 1990 palliative care is the active, fully comprehensive care of patients who suffer from diseases which do not respond to curative treatments. The treatment of pain and other symptoms and also the treatment of psychological, social and spiritual problems are of outstanding importance. The purpose of palliative care is assuring the best possible quality of life for patients and their families. Palliative care relieves pain and other tormenting symptoms.

It appreciates life, considers dying a normal process; avoids special life prolonging treatments, it does not delay but it does not hasten death either, integrates psychological and spiritual factors into the patients' care. It offers a supportive system so that the patient can live as actively as possible until his death; it offers a supportive system for the family during the time of illness and in the phase of bereavement; it helps the family by applying team work.

The Economist Intelligence Unit report says that as a result of the public state support for the care of dying patients and the efficient hospice network United Kingdomgot to the first place among the 40 countries listed, despite the fact that all in all, its health care is not the best. The researchers created an index for the„quality of death" by also including public awareness, the availability of education, the accessibility of analgesics, and by the analysis of the factors regarding the doctor-patient transparency. On the international list Australia was in second place, followed by New Zealand and Ireland. The top 10 included Germany, the United States and Canada as well. Several rich countries got to the second half of the ranking, including Denmark (22nd place) and Finland (28th place). India ended the list at the very last place, but Portugal, South Korea and Russia were also listed among the worst ten. Hungary and France scored 6.1 points out of 10 points and thus were given a tie for the 11th place. The report showed that, in the worst cases, the quality and accessibility of care were often insufficient and there was no functioning coordination policy at all. The researchers found that only a few countries, not even some rich countries with a leading healthcare system, include the care for dying patients in their comprehensive health policy. Whereas in many states, the increasing longevity and the aging population mean that the demand for the care of dying patients will rise steeply. The falling birth rate, being typical of developed countries, complicates the situation further on, and for the first time in history the number of people over the age of 65 will exceed the number of children under the age of five. According to the report this will raise new and complex problems for the dying.

The survey also shows that Hungary cares for people approaching the end of their lifetime in an exemplary way. In Hungary people have had the right, provided by law since 1997, for the so-called palliative care, i.e. for non curative treatments with the purpose of improving the quality of life of and relieving the suffering of patients approaching the end of their lives.

The situation in Hungary

Act CLIV of 1997 also includes the definition of hospice/palliative care in Section 99 Subsections 1 to 4 under "End-of-Life Care of Terminal Patients".

The regulation of patients' rights can be found in Title 2 of this law. A few rights that deal with the rights of incurable patients in a severe condition and respectively, the rights of the dying are important to be emphasized.

- one of them is the right to have their pain relieved – "each patient shall have the right to have his pain controlled and his suffering relieved." Section 6
- the other important right is the right to have contact, which declares that "a patient in a severe condition shall have the right to have the person designated by him stay with him." Section 11
- a patient in a severe condition is also entitled to the right to human dignity, which declares that "the patient's human dignity shall be respected in the course of health care" Section 10

Respect for human dignity necessitates that the dying person receives humane care and his wish is acknowledged in the final questions. His pain has to be relieved and his physical and psychological suffering has to be mitigated. The patients' potential loneliness needs to be dissolved by emotional support, assisting their autonomy is an un-omissible part of understanding care.

Living Will

There has been an opportunity for the application of *"Living Will",* for making and using this statement respectively also in Hungary since 1998. In case of subsequent mental incapcity a mentally competent person can refuse certain life maintaining, life saving interventions in an official statement, if he suffers from an incurable disease, and as a result of his illness he is physically incapable of taking care of himself and his pain cannot be relieved, not even by appropriate medical treatments. Following the disclosure of Act XLIV of 1997 on Health, the Governmental Decree No. 117/1998 (June 16) on the refusal of certain healthcare treatments provides regulations on the right to refuse treatments and within this, it gives detailed rules about Living Will.

Pre-nursing taks

Nursing case history

During the nursing case history the patient's personal information, his objective and subjective symptoms, complaints must be assessed, touching also upon his physical, spiritual, social and spiritual needs. During the detailed survey, if possible, an autoanamnesis should be strived for, if this is not feasible, a heteroanamnesis will be required. Information must be obtained with regard to the nature of the knowledge the patient has about his disease. Besides assessing the somatic status, the needs regarding the patient's psycho-social status must also be assessed and all of this may be supplemented by a survey of his mental state. Information must be gained about the patient's relationships, considering family, friends and his social background. The most important criteria for assessment and observation are as follows: drug hypersensitivity, allergies, status of physical constitution, skin condition, vital signs (blood pressure, pulse, respiratory rate, body temperature, oxygen saturation), quality of respiration, if oxygen therapy is needed, discharge, cough, mobility, the usage of supplementary devices, sensory functions (vision, hearing, taste), gastrointestinal system (appetite, teeth, diet, swallowing / chewing difficulties, nasogastric tube, tube feeding, nausea and vomiting, bowel sounds, bowel movements, stoma), nervous system condition, mental state (speech, understanding speech, orientation, memory, state of consciousness, safety rules (rails, bed bars), the patient's sleep, communication, basic care, nursing care needs (A-S nursing categories), emptying needs (urine, faeces).

Nursing diagnosis

After the nursing case history, actual and potential nursing diagnoses are established by the nurses on the basis of the survey. A correctly set up nursing diagnosis reflects the changes in nursing care and in the level of well being, therefore the continuous modification of the nursing diagnoses is necessary. The problems listed in the nursing diagnosis form the basis for the nursing care plan.

Nursing care plan

The nursing assessment of the case history and the formulation of the nursing diagnoses are followed by planning. The care plan includes determining the patient's and the family's needs, the selection or modifications of nursing interventions in relation to the results of the nursing surveys. The care plan, like in case of any other patients, also in case of a terminally ill patient has to focus on the patient and not the disease, it must be holistic and individualized. The nursing plan includes setting the priorities of the nursing diagnoses and needs, setting the targets, determining the efficiency criteria, the nursing interventions and their prioritization, getting other health care professionals involved and the cooperation with them in determining the appropriate care for the patient, carrying out the nursing activities and the therapeutic activities prescribed by a hospice doctor, and the activities related to them. Hospice care involves taking care of hygienic requirements, breathing, nutrition, emptying and care for ulcers, cancerous wounds, sleeping, mobility, spiritual issues, communication, the last hours and thelast offices for the deceased.

An important factor is the accurate description of the symptoms associated with the nature of the underlying base disease, which should include the beginning of the symptoms, the duration of their existence, their periodicity or permanent nature and the quality of their process (continuously worsening or stagnating symptoms), which can be done by using the ESAS (Edmonton Symptom Assessment Scale). The WHO (ECOG) scale (1-4), or the Karnofsky scale (0-100%) is to be used for the survey of the patient's general condition. According to the WHO, the symptoms are scored on a 0 to 4 scale, and they are also denoted by words, such as: none (0), mild (1), moderate (2), severe (3), continuing (4).

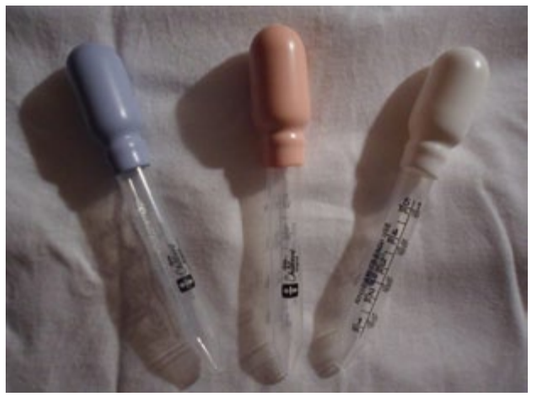
Nursing principles regarding the major symptoms

Hygiene

While meeting the patient's sanitary needs, his activity, co-operation, muscle strength, coordination ability and his current general condition must always be assessed. Respect the patent's wishes if he wants his family to assist him maintaining his hygiene needs. Our goal is to clean the skin, to stimulate circulation, to reduce discomfort and body odour, and to increase the extent of mobility. Keep the patient at a warm place, free of draught. Ensure the patient's being undisturbed, his comfort, safety, and always consider and support or facilitate his need for intimacy. Use bathing time for talking to the patient and observation. Encourage the patient to be independent as much as possible. Keep his skin dry, provide hydration for his skin by the application of skin refreshing lotions, skin care oils, body oils, creams, vegetable oils and menthol gels. Body massage is to be emphasized at the areas of the back, hip, elbows and ankles. Provide the patient with the necessary devices (bathtub stool, shower chairs, patient lifting devices) to implement his hygienic needs.

Nutrition

70% of tumourous patients are affected by loss of appetite, 50-60% of them have anorexia-cachexia syndrome. In case of appetite loss they should stay away from the kitchen, because they can get full just from the smell of food. They should rather eat more often, but little at a time. Make serving the food aesthetically an important issue. The timing of the meals should be adjusted to the patient's sense of hunger. When the body prepares to die, it is completely normal that eating becomes less significant. The appetite is continually declining. This is one of the changes which is the most difficult to accept for the family. All foods lose their taste. In one minute the patient wants something, in the next minute he does not. He prefers liquid to solid food. It is often said that "now I do not want it." First, the meat is left out, followed by the vegetables, then mashed food is not accepted either. This is an entirely normal process. The body needs a different type of energy now. It is not the physical, but the psychological, spiritual energy that plays the leading role. The patient must be encouraged but not forced to eat. Aggressive calory intake is generally ineffective. Terminal patients are incapable of intaking the normal 1.5 to 2 liters of fluid. As their condition progresses, during agonization times this amount gradually decreases up to 1 to 2 dls of daily fluid intake. This amount of fluid is enough for the patient not to have a feeling of dehydration. Different feeding devices are used in case of oral administration (beaked cup, syringe, fluid dispensing syringe – Picture 1). The susceptibility for oedema is higher in case of cancer patients, their volumen loading capacity is smaller. Upon



Picture 1 Special fluid dispensing syringes

giving them infusion at this time there is a risk of respiratory discharge accumulation and due to the larger chance for a circulatory failure the patient's mortal agony is made more difficult. Consider what the patient likes, what he just wants. To do this, an accepting, tolerant attitude is needed. Choose the most appropriate form of food (thin, pasty, solid) for the patient. Let the patient's choice of food be what he likes and what is available. It is important to assess the nutritional status, to get acquainted with the practical and special issues, and most importantly to get to know the family's cooperative skills. In light of this information the expected objectives, results and the opportunities for help can be set. The knowledge of the nutritional anamnesis, the laboratory results, the anthropometric measurements, the establishment of the psychosocial status all serve the assessment of the nutritional status. These include the choice of the planned diet type, the determination of the quantities to be consumed, fluid substitution, the choice options in food preparation and administering different formulas. It is very common that patients reject formulas. They got used to their taste, they complain about a by-flavour. It is worth recommending formulas of a variety of tastes, to consume them chilled, or even adding them to other food. Formulas are advised to be added to the patient's diet gradually, in small quantities, so that his body gets accustomed to it. This prevents the development of nausea or diarrhea. Making the diagnosis includes getting acquainted with the special problems. These are the intake of more or less food, the lack of self-sufficiency in the diet, pathological changes in the mouth mucosa, changes in the quantity of body fluid, stool problems, pain, body image disturbance, disturbance of social relationships, impatience regarding eating, diffuse interest and so on. These are usually known to everybody. In collaboration with the patient and his family the biggest problem is caused by the patient's and the relatives' different ideas associated with the disease and nutrition. Based on experiences, it primarily refers to expectations about quantity and there is a difference in attitudes and in determining the goals.

Mobilization

Before the mobilization of the patient, the patient's range of motion, his ability and his current physical condition need to be checked and assessed. In the course of mobilization the patient should be encouraged for mobilization and he should encourgaed to be independent as far as he can. If the patient is minimally mobile, supplementary exercises arerequired, the limbs and joints have to be mobilized at least twice a day. Bending and moving the elbows, mobilizing the hands, wrists, fingers, lifting the arms, which can also be bent behind the head, holding the shoulders, moving the head sideways, raising the knees to approach the chest are to be done. Mobilization intrinsically includes the application of a variety of physiotherapeutic treatments and massage, which significantly increase the patient's quality of life and feeling of comfort.

If the patient is unconscious and therefore immobile, it is recommended to get two persons involved in the mobilization process every two hours and in positioning such as turning the patient on his side, making him sit up, sit to the bedside or sit outside every 15 to 30 minutes.

Pain

Dealing with pain is an emphasized priority. It must also be recorded if the patient does not give any indication of pain. Pain must be objectivized, if present, by a pain assessment form, and by applying pain assessment scales, such as e.g.: the visual analogue scale (VAS), numerical scale (1-10), category scale (no pain, mild pain, moderate to severe pain) and with the help of a face descriptive scale. It is important that the nature of the pain, described by the patient's words, is written down, recorded. The intensity, cause, location, beginning, frequency and duration of the pain must be determined on the pain assessment form. It is particularly crucial to classify the pain (acute, chronic), whether the patient has a breakthrough pain, the patient should characterize his pain (radiating, throbbing, aching, superficial, deep cramping, burning, splitting, numb, stabbing, sharp, dull). It is important whether the pain influences a patient's appetite, attention, relationships, physical activity, sleep, emotions. Is he taking any painkillers at present, and if so what and to what extent it is effective. For relieving pain, the physician's instructions must always be followed and it is necessary to apply the pain steps of the WHO (NSAID, weak / strong opiates) and other alternatives (electro-therapy, psychotherapy, relaxation exercises, physical therapy – TENS, anesthesiological, neurosurgical interventions, methods). For successful pain relief the support of the family, communication and psychological leadership are necessary.

Basic pain relieving principles in nursing:

- teach the patient and his family how to administer painkillers, if possible oral administration should be done, if it is not possible, find other ways of administering them (transdermal, sublingual, nasal, rectal, injection, in the form of an infusion pump, mixed with liquid or food)
- always give painkillers in fixed intervals (write them in a calendar)
- keep the physician's instructions, or make them kept, watch the way of administration and the dosage
- describe the instructions clearly
- make sure that the pain does not return and the patient remains awake as much as possible, so pay attention to the pain scale of WHO and observe the principle of gradualism
- give advice to the family about further painkilling methods
  a, emotional support
  b, physical methods (stroking, massage, rocking, vibration), hot-cold therapy, deep breathing techniques
  c, cognitive methods (recreation, such as radio, music, imagining a pleasant situation)
  d, spirituality (prayer)
- watch the symptoms that may occur during pain relief,

the complaints (constipation, nausea and/or vomiting, respiratory deficiency, confusion, drowsiness, reduced alertness, muscle spasms/ muscle cramps, itching, urinary retention) call the attention to any of these and inform the patient, his family and his physician.

Bedsores, tumourous wounds, stoma, oedema

Nurses can do the following things to prevent bedsores and to heal developed decubiti. Use the options for changing place and position as often as possible. If it is possible, make the patient sit on a chair for shorter periods of time. Encourage the patient to move around in bed or outside the bed. Apply comfort and pressure reduction devices (Edelweiss pillows, antidecubitor mattresses,„egg-container" Perimed sponge mattresses, air mattresses, water beds, air beds). The bedding must always be kept clean, dry, tidy and smooth. The patient's skin needs to be kept dry, make arrangements about its hydration by using refreshing skin lotion, skin care oil, body oil, cream, vegetable oil and menthol gel. Body massage is extremely useful in the back, hip, elbow and ankle areas, focusing on the areas exposed to pressure.

In case of developed decubitus, it is to be treated by selecting the appropriate method for treatment of the various stages, by the application of skin protection creams, by doing wound rinsing and using modern dressings (impregnated sheets, alginates, hydrogels and hydrocolloids) and by taking proper notes on the wound or decubitus form. The most common risk factors for developing bedsores are: incontinence, cachexia, immobility, anaemia, inadequate beds.

7-8% of cancer patients suffer from cancerous wounds, which reduces the quality of life to a great extent. The unpleasant smell, the pain, the changes in the body scheme implies significant social isolation. This symptom most commonly occurs in case of oral tumors and breast cancer. The wound must be covered with sterile gauze, absorbent wound cover. The symptoms can be reduced by disinfection and deodorizing, for which magisterial solutions, physiological salt solutions, skin and mucosal disinfectants prescribed by the appropriate physician are to be used. Odour absorbing dressings containing carbon and disinfectant iodine and silver, used in modern wound care, are applicable.

Stoma, fistula is very rare among terminally ill patients. The appearance of fistula is mainly typical in case of patients having undergone radiation treatment. The stoma, fistula region has to be cleaned with lukewarm soapy water and treated with skin protective and water repellent cream.

Nearly 20-80% of tumourous patients suffer from oedaema, lyphodaema appearing all over their body. Peripheral oedaema is terminated by the propup of the limbs, by mobilization and isometric exercises. The administration of diuretics may potentially help. Lymphodaema is unilateral, it occurs most commonly in the upper extremities. The protection of the skin and protection from injuries is important. It can be reduced by wearing loose compression stockings. Measuring blood pressure or subjecting to any other pressure, giving injections, administering infusion or branule is strictly forbidden on oedaemic hands.

Itching

The itching sensation can be caused by numerous drugs or other allergizing factors. Dehydration, fever, anxiety or fatigue increase it. Skin injuries must be avoided (alcoholic products, coarse clothing, frequent hot baths and soap often cause skin injuries, so they are recommended to be avoided) and oily, moisturizing rubbing should be applied instead. Sweating processes need to be avoided as well. Medication can also be used upon a doctor's instruction.

Oral care, mouth ulcers, dry mouth, dysgeusia

In the course of hospice care performing preventive interventions is important. The most common mouth problem is halitosis (foul-smelling breath), which is caused by poor oral hygiene, or tumor-associated necrosis. Taking care of good oral hygiene is of paramount importance. It means brushing one's teeth with a soft toothbrush, cleaning the tongue, palate and gums (apply toothpaste, mouth rinse solutions, diluted salt water). Clean off the food leftovers stuck on the tongue, gums, teeth with cotton wool, gauze, a soft cloth or a dental care cotton bud. 40-80% of the patients complain of dry mouth. It is often caused by tumors, cancer treatments, medications (opiates), or even by oxygen therapy.

In case of a dry mouth it can be advantageous to frequently sip drinks, to suck at tiny, maybe even lemon ice cubes. Moisten the patient's mouth as often as possible with water, ice cubes, wet sticks, wet gauze, or with high moisture content fruit. Water spraying, inhalation or the humidification of the air of the room may be a solution to the problem. Vaseline or oily lip cream is practical to be spread on the lips. In case of ulcers or inflammation of the mouth, do the cleaning and rinsing of the mouth with diluted salt water, disinfecting or antibiotic mouth rinsing solution after meals and before going to bed. This can be done as often as possible, even up to 4 times a day. Avoid too hot, cold or spicy food. The complaint of a taste sensation disturbance is difficult to detect, but it occurs in 30-50% of patients. The decreased number of taste buds and their reduced sensitivity may cause this symptom. It is recommended to advise the consumption of food with high vitamin content. Eat plenty of fruit, vegetables, use stronger spices, more sugar, maybe some vinegar and lemon. Eat more easily digestible food (fish, dairy products). Eat cold or lukewarm food and drink more fluid.

Vomiting, nausea

The symptom occurs in 40-70% of cancer patients. If the patient is feeling nauseous he should rely on his preferences and eat the kind of food he likes. For drinking, water, lemon water, fruit juice or tea or sucking lemon ice cubes are good choices. He should gradually, slowly eat and drink smaller portions. Family members should avoid cooking, baking near the patient because odour substances may increase this feeling.

Constipation

It affects 75 to 90% of palliative care patients. If a patient has no bowel movement for over three days, an appropriate nursing intervention is needed. It is caused by the decreased fluid and food intake, the increased loss of substance in case of vomiting or diarrhea, inactivity, immobility, weakness, psychosocial factors, intestinal obstruction, drugs (opiates). The basic principles are to increase the patient's mobilization, fluid and fibre intake (fruit, plum products, coffee, senna tea), if necessary, enema or medication.

Diarrhoea

Diarrhoea in terminally ill patients does not represent a large percentage. The main reasons can be: laxative overdose, underlying diseases. In case of diarrhoea there is an increased need for fluid intake. In case of persistent diarrhoea, it is important to point out a supportive diet, which is rich in vitamins and minerals, it includes appetizing food and food that has a faecal retention quality (e.g. bananas).

Incontinence

For patients with stool, urine incontinence problems it is important to protect the skin (skin protection cream, moisturizing cream, skin cleansing foams) and to keep it dry. Particular care should be taken in the rectal area after bowel movements. Selecting and providing customized supplementary accessories and devices (sanitary towels, nappies, toilet, bedpan, and bed urinals) are indispensable during the care of patients. In case of retention, or even for the purpose of examination or therapy the patient's catheterization is important.

Confusion

In case of patients suffering from confusion, different co-symptoms appear, such as: forgetfulness, concentration disturbance, changes in the way of thinking, speech disturbances, changing mood, unacceptive behaviour, cooperating disorder. As much as possible, keep the patient in his familiar environment where his own things, objects can be easily reached. Keep a chronological order for the patient's daily activities. Use simple sentences when you speak to him.

Anxiety

Take time to listen to the patient. Discuss the problem confidentially. In order to reduce anxiety soft music, massage, or different therapies may help the patient to relax.

Praying together is also of great significance in dissolving anxiety.

Sleep disorders

Listen to the patient's personality, problems and fears. Reduce the external disturbing factors (e.g. noise). Do not give the patient strong tea or any drinks with a caffeine content late in the evening. The existence of pain and other symptoms also play a large role in sleep disorders, their management is also important.

Cough, shortness of breath

When these symptoms occur, it is important to ensure a semi-sitting position by the application of comfort devices (pillows, back supports). In case of prolonged, severe coughs, honey, lemon, eucalyptus leaves can help. Give the patient water frequently (it loosens sputum). Open the window for the patient often, so that he gets fresh air.Different physiotherapeutical activities aiding respiration may help getting rid of sputumand so aid and improve breathing.

Fever

FeverIn case of fever, in the course of sweating, the patient loses a lot of fluid. Therefore he is to be motivated to consume liquid. In case of prolonged fever, physical and medicational fever reduction are to be considered. Preferably wearing light, airy, cotton clothing is best for the patient thus avoiding synthetic materials..

The psychosocial status

Listening to patients, counselling and providing them with emotional support is very important. This can be achieved with sufficient empathy, patience, caring attention, accepting behaviour and supportive communication. The nurse must learn empathy, understand the patient's responses in the different life phases, in the stages of dying. In the phase of *denial* he must not be made to roughly face the facts. We need to know that when he denies the facts, he is defensive. He is hiding behind the severity of the disease to gather strength. He can not currently have any more information about the disease, about the expectable occurrences. During this period, he can be helped the most if, considering the options, he is encouraged in his activity but he is gently cautioned when making unrealistic plans. Taking realities into account gradually helps the patient to recognize the facts.

In the phase of *anger* it is very difficult both for the patient and his environment. It is not a pleasant thing to be together with an angry and aggressive person. Sometimes it is difficult to sympathize with someone who is accusing and criticizing. However, if we understand what the message of the behavior is, we can effectively help him. He sends the message: "Do not leave me alone with my feelings, because I can not cope with them. Listen to me, spend time with me, feel my desperation." Therefore, we can be of help if we let his anger and bitterness break to the surface and if we are not angry with him, but accept him. This way we can help him so that he might be able to accept his own feelings and condition.

In the phase of *bargaining* he feels a strong urge to think his entire life and past over, and it is important for him to be able to talk about it as well. He needs to tell his real or imagined sins. We need to know that by a lot of talking and repeating his stories the patient wants to reduce his growing anxiety. We provide him with valuable assistance if we listen to him carefully in this period and if we point out the good deeds of his life, his good qualities and human values.

In the phase of *depression* distant acquaintances' visits make patients tired. His need for conversations is reduced, he is often quiet. More and more often he is in a half-dream state. He needs only the quiet presence of his close relatives. His thoughts are increasingly engaged in the„secret" that is hidden by death.

In the phase of ***acceptance*** the patient thinks more and more about his approaching death. He hardly eats, speaks little, he is getting further away from life. He is not interested

in the everyday events of life, he is occupied by his own feelings. He constantly feels tired and weak. During the day he often doses off. Most of all he desires peace. It is important for us not to try to figure out how we could help the patient, but fulfil his needs and wishes.

Generally the patient wishes for more calmness and less care but it is a frequently occurring phenomenon that when the relative believes that the patient has fallen asleep and is getting ready to quietly leave the room, the patient makes a movement, reaches out to the relative and asks him to stay some more. During this period, instead of words non-verbal communication plays the main role: we should quietly be present, stroke the patient's hand, wipe his forehead. Most people are reconciled to the idea of death, prepared for it by this period. Once again the patient relives the phases of his life, he often has visions when he believes he sees and hears his dead relatives. This is a sign of death being near. Do not forget that a seriously ill person is also able to love and he feels if he is being loved. The patient loses almost everything: his control over his body, his ambitions, his independence, his personality, the image of his future, often his dignity as well. The behavior of a dying person on the way to death is very similar to the way he behaved in his life. According to the observations of Alaine Polcz (2007) it is common that in the last days of life a dying person relives those phases of his life that he has already overcome earlier, he starts believing in his recovery again, he places trust in the future, then gives way to despair and gets to the point of calming down only after this whole process. It is generally typical that the boundaries of the given phases are not rigid, along with the attributes standing in the foreground, the characteristics of the previous and the next phase can often be simultaneously observed as well. Not everyone necessarily experiences all the phases. The relatives generally go through the same stages as the patient but their experiences are usually not in accordance with those of the patient.

Special advice for care at point of end-of-life

The dying person needs the assurance that he is not left alone. Although death is an experience that everyone experiences alone, within the fullest spiritual solitude, the dying person needs to feel another person's presence, that someone, who listens, who holds his hands, is available. It is very important to the dying person in the final stage of his life that his loved ones are near him. Perhaps many nice memories are recalled when the dying person says goodbye. It is important for the family members to understand that a beloved member of the family is leaving. They must talk to him, ask him questions, these may be his last words they can hear. Perhaps the dying person says on his deathbed what he has always wanted to say but has never had time or a chance to do so. Family members should know how important their presence is for the dying person, since they were the ones who have filled his life. The dying one should be surrounded by their love and respect. Assure him that he is not left alone. Spend more time with him; he should feel that he is being loved, that his family is next to him. Both the dying and the relatives, friends need a chance for personal farewell. It is important to be honest, to talk openly with each other, because the potential offences of the past can be dealt with in this way and the peaceful departure of the one who is leaving is made easier.

Encouraging communication is important, to express the troublesome questions (e.g. child care, employment, financial situation, will, funeral expenditures, funeral requests, reconciliation period, restoring domestic conflicts). Assure the patient that he is loved and will be remembered, that he is an important part of society, his hope should not be lessenned, good old memories experienced together should be recalled. Talk about the process of death if the person wishes it. Make sure that there is a helper, a supportive environment, someone who supports him, listens to him, is near him and discreetly touches him.

Presence is important, any approach should be carried out with compassion and the patient should be visited regularly. Ensuring comfort, wetting, wiping, skin care of the lips, mouth, eyes is to be done. Keep the patient clean and dry. Keep palliative therapy in mind during the dying process. The *signs of impending death* are: decreased social interaction, a lot of sleep, more walking, the patient is confused, comatose, decreased food and fluid intake, reduced urine emptying and bowel movements, irregular breathing, „death rattle", cold, gray, or purple extremities, decreased pulse rate and blood pressure.

The *signs of death* are: breathing ceased, ceased heartbeat, pulse, fixated eyes, the eyelids are open or closed, changes in skin tone which is whitish or grayish.

If there are too many painful emotions in the relatives, the caregiver's help can be asked for in completing the last offices for the deceased. The needs of the dying at home are the same as in the hospital or in the nursing home. He must be accompanied to the toilet, or helped to the room toilet, he must be washed, his hygiene needs to be paid attention to, a change of position has to be carried out every two hours so as to avoid bedsores. The family should please the patient, cook his favourite dishes, it is crucial that he is given an appropriate amount of fluid. Do not impose a rigid timetable. If the patient asks for something, grant it. The relatives also need rest and meals. With the help of a caregiver it can be solved. It is important for the dying person to feel that his family stands beside him; it is compassionate and releases him. It is not a problem to say goodbye to each other, to talk about death and the funeral. Openness, honesty, even if painful, are helpful. Communicating information is important in each stage, offering alternatives, supporting the expression of feelings, taking care of the inheritence in a proper document, guest book, looking back at life's journey, aiding the resolving of conflicts, the closing of relationships, doing the unfinished agenda (wills).

Tasks become increasingly difficult, and emotions are more intensive with the patient as soon as the process of dying begins. Some practical things we can do, which provide care for the dying, but it is important to keep in mind that the situation is different in case of each individual and family. Priority should

be given to the significance of holistic and individualized care. As soon as the patient becomes aware of the fact, that „yes, I'm dying," he isolates himself from the external world. First the patient shows no interest only in the wider environment (newspapers, TV). Later he starts to turn away from people, close family members, and the rejection of visitors becomes more and more common. During this period the individual's focus is on his own self. At this point there is introspection, self-evaluation and the evaluation of his whole life. The number of hours slept through grows considerably, there is less and less need for outward communication, touching becomes more important.

Most of the patient's time is spent sleeping, it seems as if he were unable to keep his eyes open, though he can be woken up from this sleep any time. He often becomes confused, talks to people and about places and events which are unknown to the relatives and to the caregivers. Sudden movements of the arms occur, he crumples the bedlinen, holds onto things. Blood pressure drops, the pulse rate can vary, sometimes it suddenly goes up, sometimes it goes down. Regarding body temperature quite extreme values are experienced, very often there is very high fever that is difficult to reduce. Sweating becomes more intensive, skin colour changes. When the patient is hot, blush rises to his cheeks, whereas when cold, his skin gets bluish. The nail beds, hands and feet often become bluish. This is due to the heart being unable to provide blood circulation at the proper rate. The respiratory rate can vary, it can reach up to 40 or 50, but it can also be reduced to 6 to 9 a minute. Occasionally, the lips give a plopping sound upon exhalation. At times respiration may stop, then it restarts after a little time has elapsed. The dying patient builds up some new strength. It could happen that he speaks clearly and coherently, sits with his relatives, he may request his favourite food, which he then consumes. The patient has received the energy required for the „trip", which for now he is using for the physical functions. These changes do not always appear unambiguously, but by observing the process these signs may be recognized. As death approaches, the symptoms get intensified. Restlessness is increasing, breathing becomes slower and more irregular, it often stops and then it restarts, the eyes are half-open or even completely open, but the patient can not see anything any more, his glance is glassy and he is often in tears. The hands and feet get a purplish discolouration, the knees, ankles, elbows, the lower half of the hands, the feet and the back become oedemic. The exit from life is complete when breathing stops. In everyday language this is called the last breath. Protect the patient's human dignity, do not shorten or stretch the dying process. It is a golden rule that medication has to be reduced and only the most important, minimal medicational therapy (analgesics, diuretics), which sustain the quality of life, should be used.

Death, caring for the dead customs of bereavement, funeral

Every person experiences the thought of death, the death process in his own individual manner. Death always comes in its own time and way. The time of death is always determined by a doctor. The nurse's tasks are: protective clothing, documenting the time of death, deliverance from secretions (faeces, urine), for turning the body sideways, help is needed, putting clean sheets under the body and removing jewellery. The body has to be positioned horizontally, the used devices (catheters, cannulae) must be removed, false teeth removal, a leg tag, written by the doctor, needs to be affixed. The jaw must be tied up, eyelids closed, covered with a wet gauze, position his hands crossed, he has to be covered with a clean sheet and left in his bed or in the farewell room for two hours. The inventory is taken by two people with two copies, jewels are always indicated by their colour (yellow metal), cash in denomination, by piece and number, personal documents, jewellery and money must be stored in a safe and the rest must be stored packed in a cabinet. Arrangements have to be made to notify the relatives, a session with the other patients is needed, lighting a candle and performing pastoral duties.

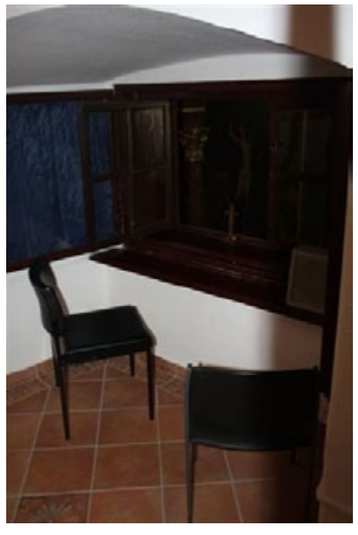
The precise point of time of death is influenced by the expectations and preparedness of the dying person. He often waits for an event which is important for him e.g. the arrival of a relative or friend who lives far away from him. It is not rare either that he dies when he is left alone for a short time, as if he did not want to burden others with the sight of his death.

It is imperative that the needs of the patient who is still alive take priority over the needs of the family. This presumption seems so obvious that the relatives who ask for help in order to care for the patient frequently feel that their request is selfish and unjustified. During the care of the patient the relatives tend to deny or belittle their own needs. 'Do not worry about me' – they often say. 'He is the one who must be helped.' The denial of emotional needs may mislead the caring team, thus its significance can be underestimated and it can also prevent the family's overall help before the occurrence of death. Psychological studies have proved that the denial or avoidance of anxious thoughts can enable people to overcome crisis situations. Several research results have proved that the probability of the development of psychological problems is smaller if the time of death is predictable and one can be prepared for it than if death takes the relatives by surprise and they are not prepared.

Making contact, the attitude of the nursing staff, a helping, accepting, open behaviour are important. The dying person should meet the ones he would like to, he should explain his feelings, he should be given the chance to touch (handshake) and assistance in the processing of losses and release. Provide a medium in which human dignity is granted until the very last moment and even afterwards. Facilitating reconciliation, apologies, the expression of forgiveness are no longer natural phenomena, not even at the bedside of the dying person. However, it is important to say what can be said by words and the certainty of Christian faith should be completed. Rituals, symbols are communicational channels that subserve the functioning of relationships among people. As far as their therapeutic effects are concerned they unburden patients, articulate things to be said, strengthen and assist individuals. The practice of the concept mostly known as the extreme unction is connected to the wish

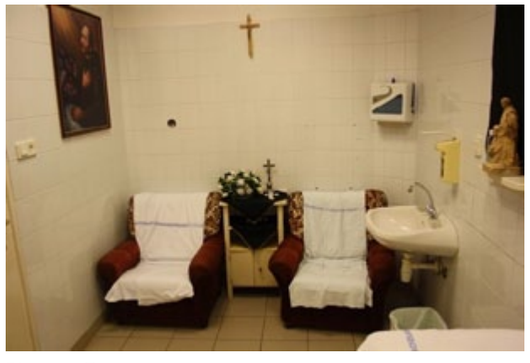
that a clerical person is preferred to be present near the dying person and he should smear him with oil. There has been a living fear up until today that where the pastor brings the Lord's Supper to the patient's house, death will come about soon.

This service is most commonly asked for by people who have had this as part of their religious practice throughout their life. Nowadays, unfortunately, a patient in a terminal state cannot take part in this practice. The dying patient meeting the pastor has had this tradition for many centuries. The destiny of the soul is influenced by the way we have lived our life. According to Michael R. Leming, a sociologist, religion evokes the feeling of pressure about death in people and then it eases the anxiety that has been evoked by it. As for Bronislaw Malinowski, an anthropologist, death is the major source of religious faith. Comstok and Partrige (1972) came to the conclusion that the death rate was significantly smaller among frequent participants of church rituals. Leming and Hinton concluded that a bell shaped relationship could be found between the fear of death and being religious. A higher degree of fear of death was typical of those who scored mediocre on a religiousness scale. The sacred confession and the Holy Communion are the actual sacraments of the dying. They can be considered as sorting the passed life. The sacred confession before death is extremely and uniquely deep. It is possible to have a holy mass in the patients' rooms. The patient is present and may take part in it. Since caring for the dying and the deceased rarely occurs in the home of the patient nowadays, the rites related to this are becoming extinct just like laying the deceased out in state at home, wailing and vigil. The health care system does not really facilitate the preservation of traditions. The rites caring for the dying are missed the most because the rites at the hospital are not real rituals but they are more like standard routine procedures which are basically of technical nature by following the requirements of the given institutions, e.g. separating the dying patient from his fellow patients, the two-hour waiting time period after death and disinfection. Hospice care strives for giving a personal touch to the hospital environment by reviving different customs (e.g. establishing a homey environment, the continuous presence of relatives, priests, preachers may visit patients, ensuring a room of piety, a chapel (Picture 2), lighting a candle after death has set in (Picture 3), tying up the jaw, closing the eyes, placing the arms on the chest, laying the deceased out in state, getting the members of the family involved in washing and dressing the deceased, seeing the deceased and praying. The establishment of farewell rooms, funerary rooms (Picture 4) may result in an immediately noticeable improvement regarding the family members' image of the given hospital and health care, and their opinion about caregiving may change. The function of the farewell room is that after the occurrence of death, it makes laying the deceased out in state possible, and thus gives the possibility of a vigil for family members. In 2003 Alaine Polcz launched an initiative, according to which, if there is no farewell room available in a health care institution, then there should be an opportunity given for a dignified farewell within hospital room conditions as well, so that human dignity can be ensured. Her unique idea was that



Picture 2. Chapel

Picture 3 Lighting a candle, display



Picture 4 Funerary rooms

the nurse giving care for the dead would not cover the dead body only with a sheet but also with an ornamented, embroidered shroud used for this purpose, and then light a candle near the bed, flowers would be placed there and maybe music, appropriate for the occasion would be played. This pattern would be more dignified than what the present-day practice shows us. The deceased is no longer laid out in state in his home but in the mortuary.

The degree of support given to the family during the patient's care can deeply influence bereavement following the patient's death. The reason for proper (not pathological) bereavement can be the family having received appropriate help and that it was possible to decrease the symptoms. The physical and psychological burdens of patients' care can be eased when the relatives see that they were able to mitigate the suffering of the patient and the patient got appropriate professional help.

According to the descriptions of the Bible the external signs of bereavement are crying, wailing, rending one's garments, wearing a sheath gown, cutting one's hair, walking barefooted, scattering dust (ashes) on one's head, fasting, sitting on the ground for seven days. The majority of the descriptions related to bereavement can be found in the Old Testament. Among the Jews some of the customs included there still live as a tradition e.g. rending their clothes. When a parent dies, garments are torn on the left hand side, whereas when someone else dies, clothes are torn on the right. Cutting into the garment is done with a knife not by the mourner but someone else and it is followed by the mourner tearing it further on as far as the area of the heart. During the first week of mourning after the funeral the mourner has to stay in his home and he is allowed to walk only either in socks or slippers during this time. During the week of mourning the mourner is not allowed to sit on a chair but only on the ground or on a foot-stool. On the other hand, cutting hair is not customary, on the contrary, cutting hair and beard is prohibited in the first 30 days of mourning (for 90 days in case of a parent's death). This latter custom appears in other traditions as well, e.g. it was part of the folk culture of bereavement even in Hungary in the first half of the 20th century. Clocks were stopped when death occurred, Catholics opened the windows for a short time so that the soul of the deceased could freely leave. Reflective surfaces were covered (mirrors, windows, pictures), they prayed for the salvation of the soul of the deceased, the deceased were washed, their hair combed, men were shaved, then dressed in their Sunday best and they were laid out in state and the deceased was wailed during daytime. There was vigil for two nights during which time the mourners were singing, praying and commemorating the deceased (the close relatives on the first evening and distant relatives, friends and aquaintances on the second day). The funeral was on the third day following death, prior to that there was a funeral speech where rhyming texts were recited, the funeral procession walked along the main street of the village, touching the church of the village, the funeral was followed by a funeral feast, which was followed by the time of bereavement. All of the worn clothes were changed to black which was compulsory for the middle-aged and old female members of the family, men and little boys wore a black ribbon on their arm or chest, a black head scarf was put on little girls' head. Nowadays only the older inhabitants of the village of Csököly in Somogy county bereave in white garments. Close relatives like husbands, wives, children and siblings mourned for one year. The other relatives bereaved for half a year, neighbours for 30 days. Babies, infants were mourned for six weeks, elder boys or girls for six months. Young people mourned for a shorter period of time. While the deceased was in the house, the mourners were forbidden to cook and during the time of bereavement men often did not shave and they did not have their hair cut. Mourners had to avoid public places, public roles (with the exception of church events) and within the time of bereavement new marriages were forbidden. Contributions to charity for the needy, for the Church or the community was an important requirement for mourners.

Picture 5 Visitors' book

In the course of evaluation it is important to conclude to what extent caregiving has delivered the desired results, how we have been able to ensure the quality of life. The evaluation criteria are to collect the assessment data from relevant sources, to analyze the efficiency of nursing interventions, to determine whether it is necessary to change the nursing care plan while taking into consideration the newly collected data, the changes in the patient's condition and the expected outcomes and the measurement of satisfaction from the patient's or his family's side should be regarded. They may share their thoughts with the caregiving staff in the visitors' book (Picture 5).

The Hospice Team

The application of the proper theoretical and practical skills, application skills, a humane attitude, and empathy are indispensable for carrying out nursing, medical and other professionals' therapies. The successful implementation is influenced

by the good professional collaboration of the providing healtcare team and the participation of other paramedical personnel. Critical thinking and a personalized approach are important factors in the implementation process. The planning and performance of caregiving does not and can not mean automatic implementation, it is essential to get patients involved and to coordinate and integrate care.

In Hungary there are 1679 hospice workers (in the year 2010 there were 153 physicians, 805 nurses, 169 physiotherapists, 87 psychologists / mental hygene experts, 206 volunteers, 37 pastors, 67 social workers, 70 dietitians, 69 administrators / coordinators, 6 free time therapists and 10 specialists helping mourners) involved in the care of dying patients (**www.hospice.hu**). The decree on the minimum conditions of hospice (Decree 15 of 2004 (8th March) of the Ministry of Health, Social Affairs and Family Health) stipulates the existence of a multi-disciplinary team, as well as a hospice education requirement done via professional courses for all hospice employees. A hospice care forms 85.3% of the physicians, 87.8% of the nurses, 89.9% of the physiotherapists, 81.6% of the psychologists / mental hygene experts, 66.5% of the volunteers, 42.7% of the pastors, 69.7% of the social workers, 73.6% of the dietitians, 77.7% of the administrators / coordinators, 83.3% of the free time therapists and 70% of the specialists helping mourners did hospice courses or further training in palliative care (**www.hospice.hu**).

Other than satisfying patients' physical and emotional needs, a hospice nurse coordinates and directs the activities of other professionals and by doing this plays a key role in the whole work. For this to happen in Hungary as well, first of all the prestige of nursing education neeeds to rise. The hospice physician's work consists of the palliative therapy of patients. He does not play a leading role in the life of the team, he often undertakes a specialist's medical tasks within hospice care as a part-time job. His non-leading role also indicates that death, the problem of dying, is not of medical but of psychological and social nature. The hospice pastor or priest satisfies the needs of patients with religious convictions and he also contributes to the patients' keeping in touch with their community despite their deteriorating physical condition. Similarly to social workers, they play a bridging role between patients, hospice and society. Volunteers represent the fact that society does not leave terminally ill patients alone. They may perform a variety of tasks, from working in the kitchen, to patients' caregiving, walking patients or even reading to them. In the course of their work they interact with patients. The task of social workers is to lead patients back to the communities that they lost contact with. The most important community is the family, but it may also be crucial for the patient to know that his friends and acquaintances support him as well. During care performed in the spirit of hospice, expectations can be influenced the most by the colleagues, i.e. by the members of the caregiving team and also patients, family and other relatives.

For health care professionals who deal with incurable patients in a serious condition, it would be even more important to educate themselves. This may refer to enhance their professional qualifications, to pay extra attention to their own mental hygiene on the one hand and also to lifelong learning. Acquiring methods with the help of which a professional involved is able to relax after stressful situations, is of great significance. Combining different educational curricula may create an opportunity for training highly qualified professionals, which emphasizes not only theoretical knowledge, but the psychology of nursing and communicational strategies. Since the continuous psychological care of seriously ill patients, the confrontation with losses and bereavement work requires special professional knowledge, these would primarily have to be acquired during graduate education by health care workers. Independently of countries, the two major shortcomings of nurses are the assessment of the specific needs of the dying and the appropriate way to meet those needs, and also to ensure an adequate number of nurses for this.

Summary

One of the fundamental purposes of being professionally accepted is strengthening the medical part of palliative care, one of the main elements of which would be to have a palliative section established at one of the medical universities. Despite the countless examples abroad, namely regarding the so-called centres of excellence, university leaders in Hungary have not yet recognized the necessity for educational and research model institutions in the area of palliative care.

The main difficulties, problems in hospice care (**www.hospice.hu**) are that patients are admitted to hospice care too late, there is asignificant lack of awareness regarding the role of hospices, a lack of collaboration primarily within the circle of general practitioners, but also in connection with referring patients to hospice care. Hospice organizations are characterized by financial problems and underfunding and a shortage of physicians and other professionals is also indicated in this field.

The previously mentioned problems, difficulties can be significantly reduced by promoting changes in social attitudes, especially in dissolving taboos connected to death, by the development of education related to this topic and by the involvement of the civilian sphere of society.

Two movements have become strong over the past years, one of them is organizing the events of Hospice World-Day, Hospice Voice (Hospice Hang) in Hungary every October. Last year commemorations i.e. concerts, exhibitions and masses were arranged for dying patients at 22 locations. The Field of Dignity program was initiated by the Hungarian Hospice Foundation. Its essence is that attention is drawn to suffering people, to the end-of-life phase and to the idea that human dignity can be maintained until the last moments of life by programmes connected to the yellow blooming of daffodils.

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10. Transcultural Health Care

BY ZSUZSANNA KÍVÉS

Introduction

The aim of this chapter is to provide an insight for the health care workers into the views and the customs based on the experience of people having different cultural background regarding health, furthermore to offer guidelines for the health care workers to provide a more efficient treatment, based on anthropological, sociological, psychological and communication sciences, for the individuals coming from different cultures.

International migrating trends

Migration is a process, in which individuals change their residence and society, respectively in a way that this is becoming permanent from a temporary change. The migration is motivated primarilyby employment intentions than religions, etnical and political reasons. Less than 3% of the population in the world, about 190 million people live outside their motherland. Over more than two centuries the western European countries mainly used to be releasing countries regarding migration, however, in the past 50 years most of these countries have become the target country for international migrants. In 2004 the number of the population of the European Union (EU-25) was 456 million people, 34-37 million people out of them were made up by the international migrants, about 8% of the total population. In the area of OECD the immigrants make up more than 23% of the population in Australia as well as in Switzerland while in Finland and in Hungary their rate is only 3% (OECD, 2009).

At the time of the millennium immigration into Italy, Portugal and Spain increased significantly while it slightly decreased into Belgium, Germany and Holland. The greatest population, 6,4 million people, born abroad live in France after Germany. Since 2006 the number of people asking for asylum in OECD countries has been increasing again. In 2008 the United Sates was the greatest receiving country with 39 400 people while France, Canada, the United Kingdom and Italy received more than 30 000 people respectively. According to the number of people per man asking for asylum, Norway, Sweden and Switzerland are qualified the biggest receiving countries. The most people asking for asylum arrive from Iraq, Serbia and Afghanistan.

General characteristics of culture

The meaning of *culture* has been defined in several ways, one of the most acceptable definitions is related to Tylor (1871) *which says "Culture is the complex whole way of life of a group or society which includes all the knowledge, belief, art, moral, law, habits and any other capabilities and behaviour which are acquired by man as a member of the society."* Keesing claims that cultures *"are systems that include the mutually accepted ideas, concepts, rules and meanings which establish the people's way of life, and are revealed in this."*

The characteristics of culture are that it is an *acquired process* (it has no genetic antecedents, it is exclusively the result of learning), *symbolic* (it is transmitted via language, the language spreads it**),** *general* (there is no existence without culture), *it is closely related to nature* (they form mutually each other mutually), *it can be distributed into levels* (international, national, sub-, group culture).

Culture is not homogeneous, so generalization should be avoided if people's beliefs and behaviour are to be explained. There can be at least so many differences between each member within the group as between each group. Generalization can lead to cultural misunderstanding, prejudice and discrimination. Furthermore *culture is never static,* it is influenced by the surrounding groups of people, and is in constant adjustment and change. It is due to the globalization of economics, communicational networks, tourism, the development of air and sea travel among others. [1]

The general cultural background has a significant impact on the people's lives including their beliefs, behaviour, world view, emotions, use of language, religion, rites, the structure of their families, nutrition, clothing, image of their bodies, their attitudes concerning health problems and pain, which can significantly affect health and health care.

The beliefs and ways of behaviour concerning health include the followings. individual factors (age, gender, size of body, appearance, personality, intelligence, experience, physical and emotional condition) educational factors (formal and informal education) socioeconomic factors(social class, economic situation, employment, unemployment, social support) environmental factors (weather, population density, environmental pollution, infrastructure – housing, roads, bridges, public transport, health care)

The passage of the patient from observing the symptoms to the hospital

As follows the passage of patients from observing symptoms to turning to a doctor can be considered, and the medical sociological knowledge being complemented from a cultural point of view. The most comprehensive system related summary of turning to the doctor is the *"Health belief model".* Its formation is related to Becker, who supposed that a certain action is produced from the resultant of the perceived threat and the benefits of its elimination. The limits of the action must be taken into account, as well.

According to the model to seek help from the doctor and to co-operate means several things: 1. you should have certain knowledge about health and should be motivated to preserve your health, 2. it must be supposed that you can be ill, 3. it must be clearly seen that the health problem can have consequences, 4. you must believe in the efficacy of treatment, 5. the price of the treatment must be considered reasonable. [3]

Patient behaviour

Patient behaviour, describes the patient's behaviour from the appearance of symptoms to the medical treatment. According to Mechanic (1962) *"the factors the effect of which is that different types of people perceive and interpret the same symptoms differentially and respond in different ways concerning them."* According to Mechanic's interpretation one of the aims of medicine is to achieve that the patients should get to the doctor in order to be provided with efficient treatment. The phenomenon of "*symptom iceberg*" (that a significant part of the symptoms is not revealed for any doctors but it remains hidden under the "surface" as the major part of the iceberg does) refers to the fact that the occurrence of certain symptoms is so common that it does not lead to visiting the doctor [4].

Symptoms, observing symptoms

According to traditional medical thinking disease is essentially a disorder which basically makes its presence known to you in two ways.

- symptoms (phenomena, perceived, experienced by the patient which warn you that there is something wrong with you) and
- signs (signs, which refer to injury, identified by doctors).

The process of observation and interpretation of symptoms is called *symptom perception.* This shows significant diversions from the point of view who considers which symptom as well as certain situational factors can play a role in the observation of symptoms:

The direction of attention. The ones who care more about their body processes, emotions, responses, can perceive the symptoms more quickly and easily. The people living in isolation, whose job is boring , the ones who require little attention usually have more complaints than the ones who lead an active life.

Positional factors. When you are less affected by external impulses, you are more likely to pay attention to yourself and observe the signs of body more quickly.

The role of stress. When you are surrounded by several unsolved problems, you can feel that you are more unprotected against diseases. According to another approach, the stressful situation can be one of the solutions of "the escape into disease", so it can occur that somebody so to say "looks for" symptoms. [3]

The evaluation of symptoms

The importance of symptoms is given by the fact if whether the individual considers it normal or abnormal. People turn to a doctor following their personal evaluation of the symptoms. According to Zola this evaluation operates five *"social buttons"*, which provide a combinational possibility, on the basis of which the individual will consider the symptoms abnormal.

The evaluation of being paralyzed occupationally and physically. The symptoms which hinder everyday activities should be considered abnormal by people. Naturally, the relation of the occupation or activity must be taken into account. For example, the injury of any fingers of hand can hinder a seamstress more than a driver.

Perception of being paralyzed in social or professional relations. Such as in the previous cases, the symptoms preventing from normal social interactions are more likely to attract the individual's attention and can lead to turning to a doctor.

Occurrence of interpersonal crisis. Certain changes in personal relations can involve the change in the perception of the symptom considered otherwise insignificant, or perhaps the reduction of tolerance to chronic pain or handicap, as well. An individual, having suffered from arthritis for a long time and suddenly turning to a doctor, may be rather the victim of a family crisis than that of the deterioration of his condition

Scheduling the symptoms. A symptom can be less worrying for a patient if it does not paralyze him in his job or social relations. In this case some kind of criterion is fulfilled for assessing symptoms. It can be a time limit e.g. *'Unless my pain ceases until Monday, I will see the doctor',* or it can be a frequency criterion – e.g. *'if my nose keeps on bleeding several times this week, then...'*

The effect of sanctions. Some kind of sanction being imposed on implies pressure coming from friends, members of the family. It often happens that the patient starts the conversation with the doctor saying *'I did not want to come but X insisted that I should come.'*

Taking another approach, the factors below determine how serious the individual judge his symptoms are.

- *How common* the given symptom is in those surrounding you or else how serious it is considered in the given social sphere.
- *"Symptoms treated as normal"* also can often be defined regarding smaller groups. E.g. at an old age the occurrence of certain symptoms is naturally more frequent than at younger age, so the perception of such symptoms can seem inseparable from the normal course of life for an elderly person. This process is called *"normalization"*
- *Previous experience* – in case of symptoms recurrent for a long time the individual is less likely to attribute significance to the symptoms than the one who first encounters it.
- The *expectations* also have an impact on what is considered a symptom and what is not. We are likely to reinforce the symptoms which are expected in advance. [4]

Becomingill

Each individual, family, cultural group and social layer determines the concept of health and illness in a different way. In the process of *"getting ill"* it plays an important role that those surrounding the individual reinforce the changes. For this a consensus, among each affected, must be reached on what health is and what is considered an abnormal symptom. The detection of illness and the response given to it by the others are significantly affected by sociocultural factors. Every culture has its own *'language of complaints'* which combines the subjective picture of the deteriorated health and its social acceptance [1]

Seeking recovery

Recognition and assessment of symptoms leads *to non-professional diagnosis*. All the explanations, provided by themselves and by the members of the family, friends, are used for this. What are the options to choose from?

- Ignoring the symptoms
- Consultation with friends, members of the family. (non-professional information system, there appear more and more experienced consultants), turning to a healer, turning to healer not in western socialist, an elderly member of the family
- The individual can turn to self-healing or can join self-supporting groups.
- The individual can turn to a health care worker, specialist, most commonly to his physician (GP) [4; 62]
-

Autotherapy

The symptoms considered not too serious (slight) are usually treated without the supervision of an expert, by ***self-treatment*** that is on the basis of the patient's own knowledge and/or the advice, experience of non-professionals. The source of his information is his own close surroundings, his family, relatives, circle of friends, colleagues, neighbours etc. Besides the widespread non-professional advisory net as well as mass media also play an important role in the spread of information regarding autotherapy. Special advice can be found for example in the medication advertisements, in the correspondent columns of the newspapers dealing with health problems or on the internet. [62]

Alternative therapies

The therapeutic activities and methods which mean an alternative, however less wide-spread, possibly in an illegitimate way, besides a generally accepted healing form in a given culture is called ***alternative medicine.*** [*62*]

It is typical that its utilization is not financed by health insurances, it is not part of the given dominant in the society health system, it can be performed without medical qualification but a certain qualification determined by legal regulation is needed for practice. It cannot be brought on a mutual common theoretical basis with the western-scientific medicine, its efficacy cannot be justified by scientific tests, it cannot generally be available in hospital health care [30]. Women, the ones with higher qualification and higher income take advantage of alternative therapies in greater proportion. However, more patients take advantage of them, who suffer from diseases in which medical science can mean less success e.g. chronic locomotor diseases, diseases of the nervous system, or patients with mental disorders, in terminal condition or with preventive purpose and intention of change in lifestyle, take advantage of it. [31]

Motivations of turning to a doctor

To decide whether the patient chooses to go to an expert is dependent on the process in the course of which patients come to a conclusion as a result of taking into consideration

the benefits and drawbacks of the above mentioned alternatives. From the individual's point of view the factors having an impact on seeking treatment from a doctor can be:

Economic factors. The financial situation, through the intermediate factors (medium) as stressful situations in life, scale of values, self-conception(approach), availability of information – show a close connection with the frequency of seeking medical assistance.

Demographical factors. Elderly people (more common chronic diseases), children, women and people with higher qualification turn to a physician more often.

Geographical distance –being near or far. Health care available in the residence is an important factor, how much you have to travel to get to the place of health care. Before the action the price of action is considered that is the energy invested and potential benefits due to the action. The probability of turning to a physician can decrease in proportion to distance it.

The above mentioned socio-eoconomical factors can often occur together, affecting each other and taking effect, so it can be considered as *an 'accumulated disadvantageous situation'* from the point of view health behaviour.

Cultural factors. The typical scale of values, beliefs, and way of life in different cultures play an important role in seeking advice from a doctor. For example a cough in itself is not considered a disease in Mexico, even if it is bronchitic or asthmatic.

In some countries the occurrence of intestinal worms is considered normal, in their opinion they assist digestion. According to surveys in England women belonging to lower socioeconomic groups consider low back pain (lumbago) concomitant with life.

According to a survey carried out by TÁRKI, 8,8% of the Hungarian population go to see the doctor without any health problems, 34,7% of it in case of more serious disease, while 40,7% of it only if there is a very serious problem. From among the factors having an impact on seeking advice from a doctor in Hungary, the expenses involved in health care and the distrust of doctors are in the first place. [2]

According to the above mentioned, the patient has to cover a great distance – both physically and mentally – until he gets to the health care provider even in the case of patients living within their own culture. The situation is even more complicated if the individual comes from some culture different from the culture of the given country. [2]

The hospital

When the individual or the people surrounding him make a decision that the health care forms are not sufficient for the treatment of the given complaint any longer, then firstly the individual turns to the basic health care. [62]. In hospitals, patients are classified and placed in wards (units) according to gender, age, condition (general internal medicine, surgery), the affected organ or system of organ (ophthalmology, dermatology), or seriousness (intensive therapy unit). Hospitals are called 'small societies' with special culture, behaviour rules and manners by anthropologists [1]. The patients' expectations and experience concerning hospital treatment are related to the nature of their disease, to the experiences obtained earlier in other hospitals, to their age and other sociological and sociocultural background factors.

The viewpoints of the doctor- nurse- patient in relation to the disease

Even if the healthcare workers and patients come from the same social and cultural group, they can view the diseasesdifferently. They utilise different evidence and judge the efficacy of treatment differentially. Both have their strong and weak points. The problem is how to realize transportation at the encounters.

The "disease": the doctor's/nurse's points of view

The concept of illness, which is put into practice during their career, is acquired by doctors and nurses step by step during their studies. All this knowledge involves certain rights and duties. The most important principles of this attitude/view are as follows (dependent on the biomedical and biopsychocosocial attitude the below mentioned play a role to different extent):

- *scientific rationalism,* every supposition must be able to be tested and justified;
- *stress put on the objective, numerical measurement,* the phenomena related to the disease can only become real if they can be observed and measured objectively;
- *emphasis on physical and chemical data;*
- *body-soul dualism;*
- *diseases considered as independent entityies;*
- *reductionism,* the doctor's attention is less focused on the real patient rather than on the specially affected organ, system of organ, group of cells or part of body;
- *emphasis put on the individual case,* as opposed to the emphasis of the role of the family and the community.

Modern medicine determines illness and health in numbers more and more.

Health and normality are described on the basis of certain physical and biochemical parameters: weight, circumference, number of blood cells, levels of electrolytes- and hormones, blood pressure etc. In each measuring process there is a given numerical domain within which the individual is considered normal 'healthy'. [1])

Disease": the patient's point of view

Cassel [46] uses *'illness'* to mean what the patient feels when he goes to the doctor and *"disease"* to mean, what he has on the way home from the doctor's office surgeries. Disease is something an organ has while illness is something a man has.

Both the meaning attributed to the symptoms and the emotional response given to the symptoms are affected by the patient's personality and background as well as the cultural, social and economic context in which the symptoms appear. In other words the same symptom or "disease" can be interpreted absolutely in a different way by two persons, having different cultures and social background. This affects further behaviour and the selected way of treatment.

In several societies e.g. all forms of misfortune – high fever, bad harvest, burglary, roof damage – all can be traced back to the same reason, all can be the consequences of divine punishment because of some kind of moral offence [1]

Explanatory model

Kleinman [48] created the explanatory model (EM) for the interpretation of illness and the process of its treatment. According to the model the concepts regarding the given disease and its treatment are a mine of knowledge used by the persons joining the clinical process. The model is accepted by both the doctors and the patients. Primarily, it provides explanation for the five aspects of illness:

- for the etiology or reason of the condition
- for the time schedule and way of occurrence of symptoms
- for the pathophysiological processes playing a role
- for the natural process and severity of the disease
- for the appropriate treatment

It is typical of the model that they are partially conscious, or not, uncertainty, the variety of meanings, frequent changes, the lack of sharp borders between thoughts and experience are typical. As opposed to it, the medical explanatory models are based on the chain of causation of scientific logics [1]

Folk diseases

Rubel [49] says "the entity of the syndromes from which the members of a particular group suffer, and in connection with which the culture of a given group provides etiology, diagnosis, preventive measures and treatment."

Folk disease means more than a group of symptoms and physical phenomena. They have several symbolic meanings for the victims. The suffering of the individual is connected with the change of natural environment or with the operation of supernatural forces. In other cases, it is presented by the help of the disease that the individual is in a social conflict, e.g. he is not in harmony with his family. [1].

The lay theory of the reasons for diseases

The lay theories of diseases can usually seek the etiology or cause of disease within the individual, in the world of nature, in the social world or in the supernatural world.

In several cases the disease is explained by the combination of two or three causes or by the interaction of different worlds. Certain communities of the non industrialized countries are characterized by social and supernatural etiology while the explanations originating from nature or the individual are typical of the industrialized western world. However, this classification is not of absolute force.

Chrisma [50] in the USA described eight groups of non-professional etiology:

- *weakening (*physical weakness which can develop due to overstrained work, chronic disease or a weak point of body)
- *degeneration (*in the structure or in the operation of body tissues or organs as it is typical of the ageing process)
- *intrusion* (USA the intrusion of an external thing "germ", or an internal thing e.g. the spread of cancer in the body)
- *lack of balance* (the unbalanced condition within the body – hypertrophy or reduction of something – e.g. lack of vitamins, anaemia)
- *stress*
- *mechanical reasons (*the operation, which is different from normal, of organs, systems of organs which is different from normal e.g. bad circulation, damage of parts of body)
- *irritating environmental substances*
- *hereditary predisposition* [1]

Vause of disease within the individual

The non-professional theories which place the origin of the disease within the individual deal with functional disorders developed mainly in the body, sometimes they relate them to the change in diet and behaviour. Here it is mainly the patient who is responsible for the disease.

According to a study the ones who could have a greater economical control over their own lives could accept the responsibility for causing the disease better than the ones who seemed to be without social and economic power. [1]

Cause of disease within in the world of nature

It contains the parts of natural environment which are supposed to result in disease e.g. climate factors, like cold, wind, rain, snow or humidity. In Great Britain cold weather as an environmental factor can cause colds and flu, the draught leads to kidney problems and rain on your head results in having a cold.

The astrological signs of the zodiac can be regarded as hereditary factors predisposing you to health or illness. Other natural ideologies spread even on the injuries caused by animals. The irritant environmental materials, such as allergens, pollens, additives, smoke and other forms of pollution can be interpreted as the assumed cause of disease in several cases.

Cause of disease in the social world

It is typical to blame others for the illness of your own in small communities where interpersonal conflicts are common. Sorcery, magic,' casting an evil eye on somebody 'are examples for this in non industrialized countries.

In all three cases illness is attributed to personal malice. *Witches* usually are different from others in appearance, behaviour, often ugly, handicapped or socially isolated outcasts of the society. Researches have pointed out that the charge for sorcery more often occurs at the time of social changes, uncertainty or social conflicts. (In the Middle Ages in England several thousands of women were sentenced for causing illness).

According to Landy [51] *magic* 'means power by which somebody can manipulate and alter the natural and supernatural events through the performance of rites of appropriate magic knowledge'. Beliefs, like these, related to magic appear in the groups whose lives are characterized by poverty, uncertainty, danger as well as the feeling of non-compliance.

Casting an evil eye on somebody, as the cause of illness was mentioned (in) all over Europe, in the Middle-East and North Africa. The person casting an evil eye does not do harms on purpose, he is often not even aware of his power and cannot control it. In societies with such beliefs it can happen that a person having come from another country or a health worker can be assumed to be the source of disease, no matter how good-willing he might be.

Cause of disease in the super natural world

In this case disease is attributable to the operation of supernatural entities like Gods, spirits, or the ghosts of predecessors. In this case domestic medication or seeking advice from a doctor cannot be considered an appropriate process. Treatment is involved in pledging to mend, Snow [52] *'Pray and showing repentance cure sin, not the penicillin'.*

Such supernatural explanations of disease in industrialized countries appear less often, however, it corresponds to the western concept where misfortune, destiny, the arrangement of stars or 'God's finger' appear in the different explanations. In several western, religious communities it happens that disease is traced back to some moral defects.

These non-professional theories of the etiology of diseases are mostly *multi-causal* that is the combined effect of several reasons is assumed. It means that individual, natural, social and supernatural causes do not exclude each other, in certain cases they are combined. [1]

The problems of doctor/nurse-patient encounter

To have a successful encounter a *consensus* about the cause, the diagnosis, the physiological processes playing part in it, the prognosis and the optimal treatment must be reached between the persons concerned. In the course of discussion several problems might arise which inhibit the consensus to be reached.

Deviations in determining the "patient". Western medicine is focused on the patient, however, it is possible that the problem is in the family or the community.

Misunderstanding the language of complaint. The doctor/nurse and the patient have different cultural and religious background, belong to different social layer, or even they belong to different age group and gender.

The incompatibility of explanatory models. The medical and lay models interpret the cause of disease, the diagnosis and the appropriate treatment in a different way. The clinical picture of modern medicine emphasizing numerical physical data, often limited and focused only on the pathogen avoids several levels of meaning of illness concept typical of the patient and the ones around him. It may happen for example that the doctor does not take into account the emotional condition of the patient because he only concentrates on the diagnosis of the physical functional disorder and its treatment.

Disease without being ill. It happens that deviations are found at the examinations but the patient does not feel ill. For example, high cholesterol level, cervical cancer, HIV-infection etc.

Being ill without a disease. The patient feels that there is trouble physically, emotionally, socially, although the examinations do not show any disorder. For example psychosomatic diseases, such as irritable intestinal syndrome, hyperventilation syndrome etc. The disease plays an important part in the life of the patient and his family, it is not enough that he is assured that there is no detectable sign.

Terminological problems. The blend of medical language and medical jargon is typical of the consultation. According to Boyle everyday medical words such as stomach, pyrosis, (palpitation) etc. were interpreted by doctors and patients in a very different way.

The role of context. The context of the encounter itself is a crucial source of disturbance in the course of doctor-patient encounter. It has two aspects:

- *previous experiences, expectations, presuppositions based on culture,* the inner context of explanatory models and preconceptions which both the doctor and the patient bear in themselves.
- *external context* which involves *the actual circumstances of encounter* and the broader social effects influencing both of them. The actual social ideology, religion, economic system, the ethnical and gender structure of the social class can belong to this.

Problems arising in the course of treatment. To be acceptable the medical treatment must be intelligible for the patient. It is of especially great importance if the treatment is associated with unpleasant effects. It can happen that the patient does not take his prescribed medicine because he feels that it does not do any good or if he does not feel ill. Neither does he take them if the given medicine has had side effects for his relative or friend.

The culture of Nursingr

According to the Figure 1 the culture of nursing appears central within several cultures. However, it is important for you to understand your own personal and professional culture and then become informed about the nursing and other cultures. The professional nursing culture has its own belief, values, standards and practice which have a crucial impact on the individual and others, as well.

Culture cannot be neglected if you want to have good interpersonal relationships and sustain better care. The health care worker that is competent culturally must understand the world view of his own and that of the patient while stereotypes and misapplication of scientific knowledge should be avoided. Flexibility and the respect of others' point of view are required for the adjustment to different cultural beliefs and practice. Cultural competence implies that you should be familiar with the patient's beliefs concerning health and illness. Health behaviour influenced culturally must be understood for health care appropriate culturally. [1]

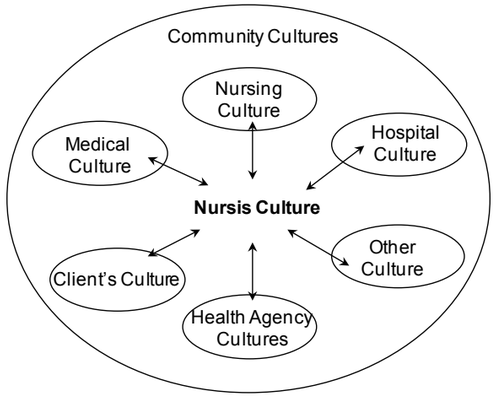

Figure 1 The nurse and other cultures [7]

Pain and culture

Pain is the most common symptom accompanying several physiological changes. As it is one of the most obvious symptoms, the motivation for taking advantage of health care, furthermore pain relief is an important part of the nursing activity so main features are to be discussed in details. Physiologically pain is considered 'an indicative tool to focus on tissue damage or some kind of functional disturbance/disorder'. Pain is of crucial importance concerning the protection of the body, survival. The responses to pain can be of two different kinds: *either unintentional, instinctive reaction* (e.g. remove from sharp or hot object), or *intentional reaction* which is aimed at removing the source of pain and tries to treat the symptom or seeks assistance to relieve the symptom. Generally this latter reaction involving others is influenced by social cultural factors. Pain is associated with social, cultural and psychological factors.

- Each social, cultural group responds to pain differentially.
- Perception of pain and the response given to it are affected by social, cultural background regarding the pain of their own or that of others.
- It is affected if they are willing to inform the doctor about the pain in any case.

Pain has two components *the perception and the reaction to it*. The so – called pain behaviour involves the change in expression, behaviour, activity, sounds and words which make the ones around you known that you need help. Pain behaviour can be possible without pain impulse, or just the opposite despite the presence of pain no pain behaviour is displayed. Accordingly, private and public pain is distinguished. [1]

Private pain

In order to get to know whether somebody suffers from pain, it must be observed what the individual communicates verbally or non-verbally. If this communication takes place, the private experience and perception of pain becomes public pain. In certain cases pain remains private as there is no external sign of pain even if it is extremely severe. It is particularly true for societies where strength is appreciated as e.g. the Anglo-Saxons (it is expected mainly from the young, fighting, warlike men). [1]

Public face of pain

Whether private pain turns into public depends on the interpretation of the importance of pain by the individual that is whether he considers it 'normal' or 'abnormal'. The definition of 'abnormal' that is the pain requiring medical treatment is determined culturally and it changes from time to time.

Zborowski [57] says that the expectations and tolerance of a given cultural group towards pain treated as the natural component of life define whether something is considered a clinical problem requiring medical solution or not.

The type of potential healers and helpers, as well defines if somebody shows pain behaviour or not. For example, a behaviour like this is more likely to provoke compassionate assistance from a hospital doctor or nurse than a soldier. He might express his pain to a physician while hide it from to his antipathetic colleague. [1]

Expression of public pain

Every culture and social group, sometimes even every family has its own *language of complaint*, which the individual can communicate his pain with his social setting. It has a special way of indicating pain or inconvenience verbally as well as nonverbally. In some cultural groups some extravagant expressions are expected when experiencing pain. On the other hand, others appreciate reservation, suppression of the symptoms. The nonverbal language of complaint involves gestures, mimic expressions, posture and exclamations which appear dependent on the presence. of context. [1]

The social aspects of pain

However long it can be the public pain assumes a social relationship between the sufferer and the other person or persons. The type of relationship determines if the sufferer reveals his pain, how he reveals it and what response he makes to it. People receive maximal attention and sympathy if their pain behaviour corresponds to the view of society regarding the way they suffer, how to focus their attention on the pain, which can be an extreme expression of emotion but the quiet change in behaviour, as well. The pain behaviour and the given responses to it have been interacting from time to time. [1]

Chronic pain

One of the special types of pain, chronic pain means a specific problem for the sufferer and those around him. The visibility of chronic pain disappears for others as time passes, although the individual keeps on suffering from it. Few visual impulses – bruise, scar, bandage or plaster – remain which remind the family and friends of the pain and the fact how it all started. Chronic pain often corresponds to social and psychological problems. For example, the interpersonal tensions can cause the development of chronic pain and vice versa. [1]

The cultural correlations of anatomy and physiology

Body image is acquired as part of the socializing process, four main areas are generally distinguished:

- images about optimal shape and size of body including clothes and accessories
- ideas in connection with body borders
- ideas regarding inner structure of the body
- and beliefs about the function of the body

The four areas, each of which has a significant impact on health condition, are influenced by social and cultural background as well as individual factors. [1]

The shape, size, clothing and surface of the body

Human body is at present in every society a social physical reality, so its shape, size, decoration is part of communication (it shows the social position, age, gender, status, occupation, perhaps belonging to a religious and secular group).

The change of social position can often be concluded from the change in clothes e.g. black clothes of the mourning widow. [35]

Polhemus enlists forms of body formation such as e.g. binding the women's feet in the Imperial China, artificial fattening of girls in certain parts of West-Africa, tattooing of the body among the natives of Tahiti and America, the insertion of big sized ornaments in the lips, earlobes near the Amazon as in Brazil- in the non industrialized societies in the past and at present.

The most wide-spread form of body mutilation is the circumcision of boy. Its benefit is that it provides protection against the infections around the penis and prevents phimosis. Circumcision of girls (it is estimated that about 80 million out of the girls and women alive currently have been operated on mainly within the – Arab world, Malaysia and Indonesia) means the removal of one part or of the whole external genital organs. [1]

In western societies eating disorders such as bulimia or anorexia nervosa occur so that ideal body weight could be reached. As opposed to this, in certain parts of West-Africa the rich sent their daughters to so called *'fattening houses'* as being fat was considered a sign of wealth and fertility. Several folk groups regard the thin weak, tired and their body ridiculous. [1]

Individual and social body

Every person possesses a *personal body* (in a physical and psychological sense) as well as *a social body,* which is necessary for him to be able to live in a given society or cultural group. There is a two-directional connection between the physical and the social body and they interact. Body and culture are not separated in reality therefore individuals significantly embody the culture which they live in. Personal feeling of identity can exceed the area marked by the skin (body borders), the details relating to it can be read about in the chapter about communication. [1]

The inner structure of body

The image about the inner body is also important because it has an impact on the perception and representation of the body complaints. It also affects how people respond to medical treatment.

Examinations about the structure and function of the body highlighted that the majority of people being examined determine the location of organs in the body inappropriately which nevertheless influences that how they interpret and present certain body symptoms as well as how they comprehend the information in connection with it.

Biological factors

Biological deviations are the different representations of 'normal', which can relate to the structure of body, the colour of the skin, other visible physical features, enzymatic and genetic variables, ECG samples, susceptibility to certain diseases, eating habits and deficiencies and psychological features. However, it is accepted that people are culturally different and the biological differences between people and between the different ethnic groups are definite, still it is rarely taken into account in health care. The biological differences between people such as smaller gen variations, which determine the different hair colour of people and define how they respond to drugs etc. – are in most cases the consequences of inherited factors, the effect of natural and social surroundings. The extent of the impact of environmental and hereditary factors is significantly different. Every human population possesses a great genetic variety. [9]

Cultural aspects of nourishment

Food plays a diverse role in human society and is deeply embedded in the social, religious and economic constituents of everyday life. It bears a series of symbolic information for the members of the society, it creates and expresses a connection between man and man, man and God, man and the natural environment. Consequently, food is an essential component of the self-framing function of any society and its attitude to the surrounding world. In this chapter on the basis of Helman's anthropological summary [1] as well as following Leininger, McFarland [7], a survey is given about the main functions of dishes, primarily focus is put on the cultural elements, at the same time it is necessary to synthesize the information below with the common food-products and with the previous information regarding dishes.

Food and human relations

Food is a means of creating and expressing relations between people in every human society. It builds up and maintains social and cultural relations with relatives, friends or even with strangers. These relations can be created between individuals, different social, religious, ethnic groups or even between man and the supernatural world, as well. In this latter case it bears several features of ritual symbols.

Distance between food and interpersonal relations

Food can symbolize the closeness or distance of social relations between people. In general, food is often used for describing the degree of friendship or distrust between persons, families or groups. It often happens that the cultural layers, castes, classes, genders and hierarchy determine how food is used, consumed and prepared. Rare and expensive so called "prestige food" is often served in higher social classes. They are usually rich in protein, difficult to obtain and expensive. In India, in the Hindu caste system, the upper castes such as *Brahmins* often get good quality food.

Food combating stress and conflicts

Food can play an important role in combating emotional stress, conflict and traumas. In several countries of the world it used to relieve anxiety, stress, interpersonal conflicts related to work, home and everyday life or frustration. Sweet food and drink is often consumed by adults and also children in western cultures when feeling anger, emotional frustration and disappointment.

Food as reward and punishment

Although with several cultural differences food is used to punish, to reward, influencing others' behaviour. In most cultures there are norms and practices how to reward or punish or give positive/negative sanctions to children and adults with food thus regulating their cultural and social behaviour. For example, in English-American culture children are often rewarded for good behaviour with sweet food.

Food and political, economic status

Food can have an impact on the political and economic status of the individual or the group. Transculturally foods are of great economic and political importance and these two view points are closely related. Politically and economically food can confirm and promote to maintain the traditional power relations and create the new power allies.

Food for preventing and treating diseases

Practically in every culture even today both the folk (general) and the special, professional treatment and cure are relied on in case of disease. In certain cultures the folk healers evaluate the condition of health and illness before the person turning to them considers whether to take advantage of professional aid. Healers often use symbolic figures and

foods when estimating condition. It is controlled in every culture what foods can be eaten or not or rather why they must be refused in certain physical diseases or sociocultural conditions.

General food theories and consumption

In non western cultures like Southeast Asian, Mexican, Caribbean as well as Latin-American cultures "cold-warm" foods and drinks and medicine are used. In these cultures the confrontation spreads beyond foods to other areas. Medication, diseases, mental and physical conditions and supernatural forces are all divided into "warm" and "cold" categories.

The concepts of cold-warm refer not to the temperature of food but to the symbolic value of foods. Health is interpreted as the balance of the two categories and disease is treated by the consumption of warm or cold food products.

Eating problems of immigrants and ethnic groups

Most immigrant groups take with them their eating culture, beliefs and habits related to food. This ensures for them the feeling of community and fulfils various symbolic, religious and social roles in their everyday life.

Adopting eating habits is one of the most important components of acculturation. If immigrants intend to give up their original culture besides clothes, behaviour, structure of family, eating habits are the last to vanish.

Saint foods are profane foods

The use of "saint" is sanctioned by religion, "profane" foods are definitely forbidden by religion. In this latter case, not only is the consumption forbidden but the physical contact with it, as well. These foods are considered unclean and harmful for health. On certain occasions or at the time of fasting all or some of the foods are considered profane. Such occasions are e.g. *Yom Kippur (25 hour fast)* for the Jews or *Ramadan* for the Muslims where it is forbidden to consume food and drink between dawn and sunset in the ninth month of the moon year by the persons over "responsible age" (boys over 15, girls 12), irrespectively of the fact if they are ill, pregnant, menstruate, breast feed.

Consumption rules related to some religions: *Hinduism:* it is forbidden to kill any animal, especially cows and eat its meat, however, milk and dairy products can be consumed.

Islam: neither pork, nor its derivatives can be eaten, the only kind of meat to be consumed is the meat of cloven-hoofed ruminant animals, after the "halal" that is the ritual slaughter. Only fish with fins and scales can be eaten.

Jewish religion: pork and its processed forms, fishes without fins and scales are forbidden to consume. The meat of the cloven-hoofed ruminant animals slaughtered ritually – kosher-like – can be consumed. Meat and dairy products cannot be consumed in the same meal.

Sikh religion: beef is forbidden to consume, pork is allowed, but seldom eaten. The animal must be slaughtered in a ritual way (jhatka).

Communication between cultures

The transcultural communication has become very important in the care of migrants and refugees in both short and long terms. It is unavoidable to comprehend the clients' verbal or nonverbal communication in today's multicultural world. Thus it is necessary for the nurses (health care providers) to speak at least two foreign languages or even more in the future. Emphasis on language competence, skills must be put on in the course of education (training) to be able to meet the demands of education, research, consultation and care. Nurses and other health care workers must be familiar with the different forms and meanings of transcultural nonverbal communication, especially if they do not speak the client's language. For example, the Americans and the English would rather keep eye contact while the Asians who would rather avoid it. Direct eye contact can be considered rude and taboo culturally in several cultures. Arab Muslims generally would regard tapping on the back offending and disrespectful. In Japan and China a deep bow of the body and the head towards the guest or the stranger coming from another culture is a sign of greeting and respect. Unlikely from other western cultures, a handshake or a wide smile can be offending, though. Arms crossed on the breast or crossed legs are often considered in non western countries adverse when talking to a stranger. The above mentioned non verbal expressions are only a few of the several ones, thus nurses must study the literature of the system of expressions of the given cultures which they encounter in their jobs.

The definition of ***kinesics*** is related to the communication of body movements, or in other words to the body language including body movements, mimics (smile, anger), gestures, eye contact and other body features. Head, face and hand movements are especially of great importance when providing care for people coming from different cultures. For example, in New-Guinea moving your head up and down means 'NO' not 'YES'. Shaking hands with left hand is to be rejected for Arab Muslims as left hand is 'unclean', food is also prepared and eaten by right hand.

Proxemics is the scientific study dealing with man's spatial usage and the underlying communicational potentials. The individual's boundaries of self-sensation do not necessarily correspond with the body boundaries, personal feeling of identity can far exceed the area marked by the skin. In 1966 Hall determined 4 invisible, concentric circles surrounding the body with different radius (among the middle class Americans):

- *Intimate distance* sphere (0–45 cm), which can be overstepped by those who the individual is in intimate relation with.
- *Personal distance* (45–120 cm) marks a less intimate relation, it is a small "protecting shield" which the individual maintains between oneself and the others.
- *Social distance* sphere (1,2–3,6 m) for impersonal, business or occasional interactions.
- *Public distance* sphere (3,6–7,5 m) in which no personal relation is realized.

The size and form of these "bubbles" can greatly change between certain social and cultural groups. The intrusion of a stranger (just like a health care worker) can be considered rude and embarrassing by the members of a given culture. However, the individual's boundaries of his body image are not static, they can change due to the emotional condition, disease, handicap, surgery treatment (e.g. amputation, transplantation), normal modified conditions (pregnancy, loss of weight) and age. [1]

Ceremonies and misfortune

Rites belong to every human society, serving various functions, in several forms and in different circumstances. Rites bear social, psychological and symbolic dimensions for the participants. Their important feature is that they are repetitive forms of behaviour which do not have direct, open technical effect. For example, cleaning teeth performed at the same time every evening is a repetitive behaviour but it is not a rite, it serves to have special, physical effect. However, this activity is accompanied by others which do not contribute to this effect directly, for example the use of the same coloured toothbrush, mumbling certain words before and after cleaning teeth, then these activities can be considered of ritual importance for the individual. [1]

Types of ceremonies

The anthropologists differentiate three types of public rites.

- calendar rites or rites related to cosmic cycles (they are not discussed in this chapter as they do not belong to this topic from the point of view of health problems)
- rites of social transition
- rites performed at the time of misfortune

Rites of social transition

They are at present in some form in each society. The changes of life cycles are related to the change of social position by the fact that the physiological and social aspects of the individual's life are combined. The series of rites related to pregnancy, giving birth to a baby, adolescence, the beginning of menstruation, wedding, burial and severe diseases serve as an example for this. The rite marks the passage from one status into another, for example from "wife "status into "mother" status in the course of pregnancy. The steps of social transition:

- *isolation* (the person is taken out of the usual social life and is isolated for a certain period by the help of different customs)
- *transition* (ceremonial rites)
- *reception* (the person returns into the normal social life and his new social role). This latter is often marked by ritual baths or other rites of symbolic purification.

Rites of hospital admission

Several healing rites are at the same time social transition when "the ill person is made healthy". The patient admitted to hospital leaves his usual life behind and takes on a transitional state which is marked by the feeling of vulnerability and danger. The patient goes through a standard admission rite when he is deprived of several marks of his social identity. Later when he recovers, he gets his own clothes back and returns into the community as a "cured" or "healthier" person (of) with a new social identity. [1]

The rites of pregnancy and delivery

Pregnancy and delivery reaches far beyond the biological event. During pregnancy the woman is in the transitional condition between two social statuses. In several traditional societies women retreat from social activities, are slightly isolated, their diet, clothing and behaviour are regulated by certain taboos. These taboos often persist in the period after delivery. For example women are regarded vulnerable against external dangers in the South-African zulu folk group until bleeding is terminated after delivery. [1]

Rites of death and mourning

In most human societies two types of death exist in reality, one *biological* and one *social*. The time period that passes between the two is different, it can last from days to years. Biological death means the end of the body function, the social death marks the end of a man's social identity. This takes place through the series of rites including burial when the society takes farewell. In most non western societies death is regarded not an individual event but a process when the dead steps slowly in the realm of the dead from the land of living beings, correspondently a change of identification takes place when from the individual living in the society becomes a dead ancestor. The soul of the dead in the period between the biological and social death is regarded as something being in a transitional condition. In this phase the soul has its social rights, especially concerning his mourning relatives. The relatives are expected to perform certain ceremonies, activities.

In western society delivery and death is becoming more and more *"medicalized"*. The natural stages of biological dying are often considered today as (anti-natural), pathologic. [1]

Spirituality, religious faith and practices

Religion is a part of or a form of representation of human culture.

Every culture has some kind of religion. Religion can be defined in various ways. According to Wallace it is an attempt to influence supernatural beings, supernatural power and supernatural forces. According to Oldnall (1998) spirituality is more than religion. Peterson and Potter (1997) propose that spirituality is a broad concept which is related to the person's entity while religion is an aspect of spirituality. Spirituality is an inseparable part of the person and his whole being. Beliefs related to the question of everyday life are different for the people having various religious backgrounds. All the activities of life can be influenced through beliefs.

In the information below you can read about questions/ viewpoints, the revelation of which promotes the awareness and sensitivity in the care of religious people : the protection of morals and private life, clothes, jewellery and make-up, cleaning and hygiene, hair care, prayer, saint days, festivals, eating habits, physical examination (surroundings, participants), delivery, birth, contraception, abortion, special ceremonies and practices (e.g. praying), attitudes to death, dying and questions of mourning, medication, healing practices, transfusion, donation of organs and transplantation, views after death, burial.

Culture and medication

The effect of medication on human physiological functions and emotional conditions does not exclusively depend on its pharmaceutical features in many cases. Several factors – personality, social and cultural background – can improve or deteriorate its effect and can be responsible for the variety of reactions given to the medication treatment of people.

The "complete medication effect"

According to Claridge the impact on the person of any medication treatment (the complete medication effect) is dependent on several components besides the pharmaceutical features of medication:

- *the physical features of the medication itself* (taste, shape, colour and its name)
- *the features of the patient* getting the medication (age, experience, qualification, personality, sociocultural background)
- *the features of the person prescribing or giving medication (*personality, age, attitude, professional status or prestige)
- finally *the circumstances* in which the medication is prescribed and given – the medication situation.

The physical situation of medication is *a microcontext* which differentiates it from the *macrocontext,* from the whole social, cultural, political and economic milieu in which the administration of medication occurs. [1]

Culture specific diseases

There are diseases which occur in limited extent worldwide due to the special combination of cultural practice and environmental circumstances. These are generally called culture specific or culture related diseases. Some of the reasons cause relatively slight health problems while others lead to severe ones even to death. "*Rave rash*" is an example for a relatively harmless culture specific condition which appeared in the 1990s in England. A young woman was dancing at a party. As a result of the sustained vigorous dancing, and not wearing a bra, a painful rash developed on her nipples.

Culture specific mental diseases

Mental diseases are (at) present in every society, however, their frequency is different. A mild form of a mental disease can be determined as a normal behaviour in one culture while it cannot in another culture: For example, in western societies the people who often talk to their dead relatives or to other supernatural creatures are generally mentally disturbed. The same behaviour probably is healthy, furthermore it can be considered enviable in a culture with a native world view. In traditional Indian societies dreams and the visionary world is are more real in a particular sense and thus naturally much more important than in the usual human world. Table 1 displays a few examples of mental disturban ces related to non western cultures.

The model of transcultural nursing

The beginning of the study of transcultural nursing dates back to the 1950s and is related to the name of Madeleine Leininger, she carried out the first research related to the topic. According to Leininger *transcultural nursing*- is the study and practice of a human focused and scientific area in nursing which is focused on the differences and similarities between cultures. This knowledge is used by taking into account the people's cultural values, their belief and practice for assuring the special or culturally congruent nursing.

Working out the theoretical background of the cultural care is a breakthrough in the assurance of the care of different cultures. Several theories have been born in the past decades, one of the oldest is Leininger's model [7] which was improved several times between 1955 and 1985 according to the experience and researches. In the centre of it there occurs a close relationship between culture and care. There can be recognized similarities between each model like in the case of the model, of Giger and Davidhizer, the primary (gender, race, nationality, religion etc) and secondary (qualification, occupation, marital status, physical features, sexual orientation etc.) features in the context of the individual, health, community and global society. (The original description of this latter model can be found on the following link: http://tcn.sagepub.com/cgi/content/abstract/11/1/40)

Table 1. Few examples of mental disturbances related to non western cultures.

Country/Continent Name	Main	Symptoms
Japan	tajin kyfou sho	It is social anxiety (social phobia), with the sufferer dreading and avoiding social contact
China (Taiwan)	Shejings huairou	dizziness, headache, concentration and memory loss, gastrointestinal disturbances, irritability
Korea	hwa byung	panic, fear of death, dysphoria, indigestion, abdominal discomfort
Malaysia, Indinesia (South-East Asia)	latah	When latah patients' startle reflexes are triggered, they seem to enter a trance. Most will begin to repeat certain words, gestures or phrases (echopraxia, echolia)
India	dhat	In traditional Hindu spirituality, semen is described as a „vital fluid" The discharge of this „vital fluid" either through sex or masturbation, is associated with marked feeling of anxiety and dysphoria.
Latin America	ataque de nervois	uncontrollable screaming and crying, inability move, fainting, loss of memory, headache, loss of apetite, anxiety
	susto	nervousness, anorexia, insomnia, listlessness, despondency, involuntary muscle tics, diarrhea
North-Greenland	piblokto, „Arctic" hysteria	hysteria (screaming, uncontrolled wild behavior), depression, coprophagia, insensitivity to extreme cold (such as running around int he snow naked), echolalia (senseless repetition of overheard words)

Leininger's "Sunrise Model" – Modell A

Leininger's "Sunrise Model " (Figure 2) depicts the theory of the universal and various cultural care. The target of this nursing guideline is to assure the holistic and culture specific care through obtaining knowledge of the client's world. It provides a comprehensive and open method for the evaluation of the individual, family, group and community. Firstly, decision must be made on who the survey is to be focused on: the individual, the group, the family, the community. Then, there are some people who concentrate on the professional and general care while others would rather focus on the worldview, social factors.

In the course of the assessment the nurse must focus on the *emik* (own inner views) views of the replier rather on the *etik (*external, general view about phenomena). The appropriate nursing requires the entirely deep and wide-spectrum knowledge of the client's world and experience including the native experience and practice concerning the things having an impact on nursing and care. For this active attention, patience, interest and listening cannot be ignored.

Following this model the nurse gets to the three types of theoretical methods concerning cultural nursing activities and decisions. Taking into account the theoretical background and the nurse's general, professional knowledge, the answers of the repliers are identified and summarized for the three methods: 1. preservation and/or maintenance, 2. accommodation and/or negotiation, 3. repattering and/or restructuring. The nurse and the client can decide together about the appropriate nursing activity and decisions which lead to the acceptance of the offered health care/nursing with great probability

To sum up, thus the data of the nursing activities and decisions come from the information obtained from the lower and upper parts of the model and by taking advantage of them and by the participants' approach, the client and the nurse come to a decision taking into account their own knowledge, values and benefits.

The constituents of the model

Cultural health care refers to an assisting, supporting, caring activity, in the centre of which is the client's health and well-being as well as his apparent and/or expectable needs.

The diversity of cultural care refers to the cultural variability and differences between people and cultures (different beliefs, values, symbols, lifestyle etc.). *World* view expresses how

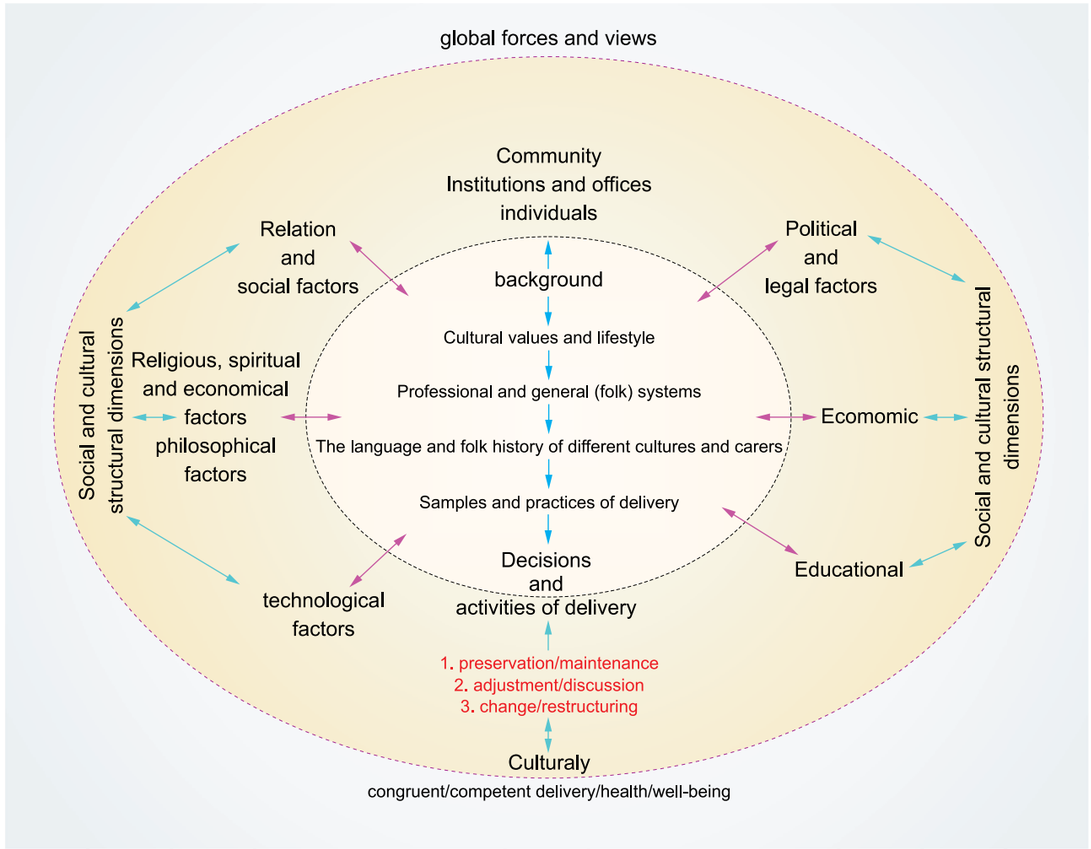

Figure 2 Leininger's Sunrise model for the general culturally competent health care delivery

the individual or the group interprets the world. It is value, approach, image, or perspective about life and the world.

Dimensions of cultural and social structure: refers to the correlative presence of dynamic, holistic, and structural characteristics of cultures (or subcultures) including religion (or spirituality), relatives (social relations), politics (law), economics, education, technology, cultural values, philosophy, history and language.

Environmental connection refers to the surroundings, events which have an impact on the individual and which are connected with the individual's experience and decisions.

General (folk) care: comprises all the folk, lay, naturalistic and traditional methods which promote and support the process of healing and health care delivery.

Professional care: is the professional knowledge based on culture and taught, learnt and passed formally or informally with human care, healing and wellness practices in the centre, which support and promote well-being, in the centre.

Cultural care: preservation and/or maintenance: the assisting, supporting, providing professional activities or decisions which promote the people belonging to the given culture to preserve and/or maintain the values and lifestyle to the well-being or cure through the appropriate care, or deals with handicap or death.

Cultural care: accomodation and/or nagotiation: the assisting, supporting, providing professional activities or decisions which help the client change or modify his lifestyle to be healthy and keep fit.

Cultural care Repatterning and/or Restructuring refers to assistive, supportive, facilitative or enabling professional actions and decisions that help dient reorder, change, or modify their lifeways for new, different and beneficial health case outcomes.

Culturally competent care refers to taking advantage of explicit health care knowledge based on culture and to its sensitive, creative and sensible use to meet the demands and general lifestyle of the individual or the group concerning the useful and meaningful health and well-being, or to face disease, handicap or death.

The suggested examination methods of the other fields

World view – how the client can see the world.

Ethnohistory – the client's cultural heritage, his cultural background, place of birth, address, parents and ancestry, life in different geographical places or surroundings, the experience of resettlement, special life events or experiences, language skills.

Kinship and social factors – family and/or close friends, relatives, their relation, its importance. In connection with health, well-being: who is a caring or not caring person if he requires care, the effect of the family (or the group) to keep fit or to get ill. In case of disease the degree of the expected care concerning members of the family and health care workers.

Cultural values, beliefs and lifestyle – the values, beliefs which are necessary to know for the healthcare workers to be able to deliver appropriate care to restore health and maintain it.

Religion/spirituality, philosophical factors – religion, spirituality, religious practice (eating, praying etc).

Technological factors – the technical devices used in everyday life, the lack of them, their assistance to preserve health, to keep fit.

Economic factors – "money means health and survival". What does the patient think of this statement, does he think that money has an impact on health, access to health care delivery or professional services? Hospital expenses contra home care. Who are the breadwinners in the family?

Political and legal factors – the effect of political activities on health, the effect of political and legal problems on well-being or on unfavourable circumstances.

Educational factors – the connection between qualification and well-being or disease (ill-health), information, values and practices of qualification which can be important for care, highest qualification.

Language and communication factors – what languages you can speak and understand, what language and communication barriers have an impact on health care, what verbal and non-verbal communication problems you have seen and experienced which have an impact on care, how you would like to communicate and why, any experience of offence or racial problem due to communication**.**

Professional and general (folk and lay) beliefs and practices concerning care – nursing practices and attitudes which are considered to be the most useful by the patient in the hospital and at home concerning well-being, recommendations, practices or treatments of care, the meaning of health, ill-health or well-being in the family or in the culture, useful professional or folk practices, food preferences, the patient's suggestions for the nurse concerning good care delivery, expectations.

General and specific nursing care factors – preference of hospital or home care, the meaning of nursing for the client, hindering or helping factors for the good care, values, beliefs and practices concerning expected nursing method.

Leininger's shortened model (Model B)

Leininger's shortened model can primarily be used in emergencies and acute care. This guideline makes short and general client evaluation possible but does not provide deep holistic knowledge. The assessment of data provides general information for the elaboration of a short nursing plan or decisions. Each phase is evident and easy to follow.

At the beginning it must be made clear if the assessment refers to the individual, family or group**.**

First phase: *The observation* what can be seen, heard, experienced in connection with the client (including clothes, appearance, characteristics of body condition, language, manners and general behaviour, attitudes and cultural characteristics).

⇓

Second phase: Listen to and learn about the client's *values, beliefs* and daily (nightly) *practices* which can be in connection with care and health in the client's context. Pay attention to the general (home or folk) and professional nursing practice, as well.

⇓

Third phase: Identify and document recurring client narratives (stories) which the client has seen, heard or experienced.

⇓

Fourth phase: *Synthesize themes* and health care potentials on the basis of the information obtained in the first three phases.

⇓

Fifth phase: *Make a client-nurse plan* based on culture, with participant co-operation for the decisions and activities for the culturally congruent care.

The main characteristics of cultural groups, case-histories

Spanish folk group

According to Galanti [12], Fernandez [15] Spector [18] the roots of the Spanish community can be found in Cuba, Middle and South America, Mexico, Puerto Rico and other Spanish speaking countries.

Religion: The majority of Spanish people are Catholic, they think health is God's gift and cannot be taken for granted. To prevent illnesses it is accepted if they pray, wear religious medallions or amulets and keep relics in the house

Social traditions: The elderly are honoured and held in high position because of their experience in Spanish families, members of the family listen to the advice of elderly people. The individual who becomes ill, first turns to the family members, especially to the old ones for support and advice who can provide secure, simple solution for the cure at home.

Health care practice: The Spanish express their emotions so that they can be pampered if they are ill, this is one way of expressing love and worries of the family. Prevention in health care is ignored, consequently the doctor-patient encounter happens late or does not happen at all. The health care system is considered to be *curanderismo*. This is a consequent way of looking at things with historic roots which unite Aztec, Spanish, spiritual, homeopathic and scientific knowledge. The curandero is a holistic healer who is asked for social, physical and psychological help.

Private sphere: Personal things must be treated within the family, virtue is respected in the Latin culture and not only in case of women. The area between the hip and knee is especially considered private.

Delivering a baby and birth: The care of woman after birth is the duty of women, in an ideal case the duty of the mother of the woman in childbed or it is the midwife's duty.

Case – histories: A Spanish woman signed the information leaflet to remove her uterus. The patient did not speak English, so her son speaking two languages served as an interpreter. When he explained the process to his mother, he seemed to mark accurately the appropriate parts of body. The mother signed the consent voluntarily. The next day when she learnt about the removal of her uterius and that she would no longer be able to bear children, she became very angry and threatened to take action against the hospital. The woman got angry because the Spanish woman's status is basically determined by the number of children she can give birth to. The Spanish man is not the appropriate person to discuss the problems related to the woman's private parts of body. The son explained to his mother that the tumour would be removed from her stomach, and he pointed at her stomach, to a general area. Even if you speak the language, it is not always sufficient. Cultural rules determine what and with whom you can discuss. Generally speaking, it can be said that it is the best if an interpreter of the same gender is asked to help in case of sexual and private problems.

Middle East folk group

It is based on the writings of Galanti [12], Lafrey [13], Lipson [14] and Meleis [16]. The " Arab world " comprises 22 countries in the Middle East and North Africa, with a population of 180 millions. The Arabs are who speak the different dialects of the Arabic language and share the values and beliefs of the Arabic culture.

Religion: The majority of the Arabs is Muslim. Because of their religious belief pork is not eaten and alcohol is not drunk. Ramadan is respected.

Health care practice: Prayers, reading the Koran or the Bible offers help and comfort for the patients and family members and promotes the patient's cure. Modern western medical science is highly respected and doctors are trusted. Professional help is asked for early, questions are answered, health care specialist's advice and the instructions are followed. As soon as the symptoms get better, a lot of patients stop medication prescribed by the doctor, or do not return to the check-up examination. Nurses are considered assistants and they are not regarded as health care specialists, their recommendations and advice are not taken seriously. In case of pregnancy or gynaecologic examinations women prefer female doctors.

Social customs/traditions: The elderly are respected because of their experience in Arabic families. The members of the family take into account of the council of the old people into account. The individual who becomes ill first turns to his members of the family, especially to the elderly for support and advice who can offer secure, simple cure at home. If the patient gets into the hospital, the friends and family are socially expected to visit him and take some presents such as flowers, cakes or chocolate.

Most Arabs consider ***the delivery of a baby and birth*** to be the woman's duty. In general female relatives and friends assist the woman giving birth to a baby, fathers do not go into the delivery room.

Private sphere: The Arabs are not willing to provide detailed information about themselves or their families to a stranger. They are conservative, get confused if it comes to sexual relations or other personal questions.

Diet: at the time of Ramadan a lot of patients do not take their medication or avoid eating during the day. As Muslims do not eat pork, the patients do not eat all hospital food.

Case history

A 27-year-old man did not let the male laboratory assistant enter his wife's room – who was just delivering a baby- to take blood. Finally the health care staff convinced the man that the laboratory assistant's job was needed and he allowed the assistant to enter the room with reluctance. He took care of his wife to be covered completely as a precaution. She reached only her arm out of the blanket. Honesty is one of the greatest values in Arabic families. The female virtue and morality is determining in the honesty of the family. Male nurses cannot be allocated to Muslim women as assistants. The female purity and virtue are the most important values in several parts of the world. In this case it is the man's responsibility to protect the woman's virtue in the course of health care, in several cases a simple sign on the door "please, knock at the door before you enter" might help their care.

Asian community

It is based on the writings of Galanti [12] and Spector [17]. Chinese medicine teaches that health is the condition of spiritual and physical harmony with nature. Healthy body is in a balanced condition. When the balance breaks, it results in illness. Their bodies are considered to be gifts from their parents.

One's body is not one's personal property, it must be looked after and maintained properly. In Asia there is balance between yin and yang, everything in the universe is either yin or yang including illnesses, which lead to excessive yin or yang, lack of yin or lack of yang. The Asian patient does not often complain of what disturbs him. It often happens that the only sign that there might be some problem is an untouched tray of food or the patient's quiet drawing away.

Case history: A middle-aged Chinese patient refused to take painkillers after his cataract operation. When he was asked, he answered that the inconvenience had been tolerable, and he remained without medication. Later the nurse found him restless and feeling poor, so she offered the painkiller again. The patient refused it again, saying the nurse's responsibility in the hospital is much more important than his convenience and he did not want to be a burden on her. The nurse definitely insisted on the fact that the patients' convenience is one of her most important duties, finally they agreed on the medicine being taken by the patient. The Chinese learn self-discipline. The needs of the group are much more important than the individual's. Another factor leading to the refusal of the painkiller was politeness. It is generally thought (by the Chinese) that it is impolite to accept something which is offered for the first time. The most secure approach concerning the nurse's attitude is prevention, the painkiller should be offered without asking the patient. Nurses must be aware of the rules of the Asian etiquette when painkiller, food or other services are offered. If the patient keeps on refusing medication, his wishes must be held in respect.

The Black American folk group

It is based on the writings of Galanti (1991), Spector (1979).

The roots of the members of the Black community are in Africa, most of them got to America as slaves from the western coast of Africa. The Blacks immigrated to the USA from the African countries, the islands of the West Indies, the Dominican Republic, Haiti and Jamaica in great numbers. Most of them are the descendents of slaves.

Religion: God is considered to be both the source of health and severe illness. People believe in the healing power of religion.

Health care practice: The roots of several practices of prevention and treatment go back to Africa, the most common and often performed method of treatment of illnesses is praying. At the same time imposition of hands is quite often applied. The traditional black belief concerning health does not make a difference between soul, body and spirituality.

Social customs: the elderly are held in high respect as long life enables the person to acquire lots of wisdom and knowledge. Death is described to be a passage from the realm of Life into another one, or a transition from this bad world into another condition. Thus burial is often a festival with a feast after the burial ceremony.

Case history: The patient is a 9-month-old black boy. His hands and legs have been tied to the bed to prevent him from pulling out the infusion. When his grandmother realized this, she became very angry. "How can you tie down a baby? He has not done anything bad! He is not a dog!" The grandmother had probably experienced several unfavourable discrimination as for the whites, tying down was considered as a rascist deed. After the nurse had explained its aim to her, she calmed down.

Gypsy folk group

Approximately 15 million gypsies live scattered in Europe, but today they can be found in every part of the world. The gypsies (Romani) are not a homogeneous folk group but the complex of different groups as for ethnography, sociology and linguistics.

Religion:

The gypsies are basically religious. In most cases they belong to the religion which is the dominant one in the given country [23].

Social roles, customs regarding their lifestyle:

Each gypsy considers the other persons in his own ethnic group to be his brother. The basic unit of the gypsy/Romany

society is the whole big family, so when a gypsy gets ill, he is accompanied to the hospital by this whole big family, not only by his close family members. The man's opinion is of primary importance in the family [24]. To mention the functions of the body is considered impolite, furthermore the functions of the body must be hidden, not to be seen by the other gender. The upper and lower parts of the body are differentiated as clean and unclean parts. Thus when drying the body, different towels are used, pieces of clothes are separated when they wash and dry them. [21, 23]

Healthcare practice:

Gypsies rarely take advantage of heath care services, as they prefer the use of self-healing techniques (e.g. or a simple locust tree leaf can help rheumatism, cold or furuncle). Preventive treatments and techniques are generally not or only sometimes used, and they go rarely to screening examinations. However, they respect health care workers, they are often noisy and impatient.

When delivering care, the heterogeneity within the Romani community must be taken into consideration. As for the clients, there might be differences regarding age-, gender- and health condition, physical and spiritual, religious or emotional conditions at the same time. There might be also significant differences regarding their social circumstances– which determine nutrition, clothes, living circumstances/ housing etc., consequently and indirectly the health condition, as well. Their civilization bears lots of differences (including the level of education, qualification, communication, their culture concerning health and eating habits etc.). When delivering health care for gypsies, the patients are visited by the whole big family, – 10-15 people or even more in many cases – which is typical and thus marks the strong support of the patient. Therefore the strength and the traditions of the group often adjust the rules of the health care system with difficulty and can mean the source of conflicts.

Case history: The sources of case histories: the study dealing with the health care of Romani revealed the experience of heath care workers and gypsies by the help of interviews, furthermore another source is the research related to gypsy women and carried out by Mária Neményi.

A gypsy man talks about prejudice: *'Yes, they made me feel, there was a case when I went to a specialist to make him prescribe me some medication and it was my turn regarding the number. There came two ladies. One was an acquaintance of the doctor, the doctor came out or rather the assistant came out to collect the documents and asked who and why came. And at that time she mentioned that she was the doctor's acquaintance and she was called first not me. She looked at me and I was on my way to in because I thought I was called and I could enter. She told me to wait a little a bit and be patient and told the acquaintance to go in. I think this happened because of the colour of the skin, you can stay and let the acquaintance go in. This is one thing but there was a visit in the hospital and I stayed in a room where I was the only one with brown skin and it was me who was always the last one during the visit. Everybody was asked how he was feeling, if he had some complaints. And I was asked nothing. When they came in, they read the hospital register and told me 'It is OK, you can go home!' They asked me nothing! They did not even ask me how I was feeling. This is due to this, as well. I do not want to pass judgement. Generally speaking, the doctors I have met so far, 50%-50%. 50% was prejudiced, 50% regarded me a man. It happened at several doctors that they did not bother with me owing to the colour of my skin and inferior appearance.'*

Mária Neményi made some interviews with the gypsy mothers and health care workers about the problems of care they experienced.

The reactions of health care workers to their fertility customs and their child –rearing were considered as an expression of prejudice by several people 'it is so rude when you deliver a baby but even when you go to give birth to a child.

"…*They can't stand when somebody from here goes. I mean if somebody is a gypsy. They speak so aggressively. They are racist. If somebody has two children, they ask why you need a third one. Are you expecting the social benefit or the child benefit? According to another report 'here they do not talk to the mothers as they should have talked. In Pest, for example, this kind of speech is not allowed like here. They talk to us quite rudely. I am a gypsy if we go in and have already delivered several children, then we are asked why we want another baby, just for the child benefit? So this is why I was frightened with having the third child, I talk to told myself, it will be the same. When I went to the doctor, they asked me immediately why I wanted this child. Why weren't you more careful?*"

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11. Nursing Theories – Nursing models (complete)

BY KATALIN NÉMETH, IBOLYA TULKÁN, NOÉMI FULLÉR, VERONIKA RAJKI, MARIANN RASKOVICSNÉ CSERNUS

Knowledge of nursing can be based on traditions, experience and theories. The aim of the application of nursing theories is to show directions for practical situations during nursing practice, during nursing guidance and nursing instruction by setting up directives, as well as in the research of nursing. Nursing models are derived from nursing theories.

Definition of 'theory' and 'nursing theory'

The word 'theory' comes from the Greek word 'theorio', which means "evaluate", "rethink", "consider". A theory applies to reality as a whole or to a part of reality.

Several definers of the notion of nursing theory built on the notions from the psychology and social science of the 1960s and 1970s.

Nursing theory is a sequence of special and concrete concepts and theses which aim to explaini or describe the phenomena of interest in nursing science.

Nursing theory is none other than the perception of the phenomena during nursing, furthermore, it contains the relations in nursing or connected to nursing. Its aim is to describe, explain, predict and/or prescribe nursing care. According to Meleis's (1985), the evaluation of a theory provides opportunity for constructive criticism, through which it facilitates its development and it contributes to the work of the theory developers. According to Meleis, nursing theories developed from the reality of nursing.

Components and development of theory and nursing theory

Theories are built upon concepts, definitions, hypotheses and they affect phenomena.

Concerning nursing theory, the basic concept is to provide the best possible well-being according to the patient's (client's) or the community's interests. The categories of man, health and illness, environment and care are discussed, starting out from hypotheses, which are influenced by the role, the relationship and the interaction of the individual and the nurse. The concepts that make up the theory are organically linked and act accordingly on the expected or real phenomena, the outcome. Nursing theories yield the knowledge that the nurse'sapply within their practice.

Two possibilities of the development of theories are known, the inductive and the deductive direction.

- The inductive direction is when from a concrete case general conclusions are drawn.
- During deductive theory making conclusions are drawn from general observations, results or concepts, going towards the concrete.

Classification of care theories

Nursing theories can be classified according to the interventions, concepts they focus on, e.g. needs, interpersonal relationships or systems. Both the development of the systems and the classifications are important for the science of care. There are several opportunities for the classification of nursing theories.

1. Based on *functions,* the following forms can be differentiated (Lindberg et al., 1994):
   - Description
   - Exploration
   - Explanation
   - Prediction and control

2. Grouping, according to *volume,* can be done at four levels:
   - Meta theories
   - Grand theories
   - Middle range theories
   - Macro theories (at the nurse's practice level)

The ideal nurse's theory incorporates macro, middle range, as well as grand level theories.

3. Widely known and widespread is Marriner – Tomey's classification from 1989 in which the theories are divided into four main groups of different *themes:*
   - Humanistic nursing theories
   - Interactions, interpersonal relations
   - Energy fields
   - Systems

4. Based on their *main aspects,* in 1991 Meleis divided the theories into three groups:
   - Needs
   - Interactions
   - Result theories

The utility of nursing theories

Opportunities for making use of care theories:

- The basis of teaching nursing
- Reference frame
- The basis of nurses' ethics
- The basis of quality assurance
- The frame of nursing research
- Guidance in practical situations
- Care management

Nursing models

The word *'model'* has more to it in its meaning in the Hungarian language. It means that something carries the value of an example, has to be followed, or else we use it when building a mock-up or presenting products of fashion. At the level of science it means the description of notions, systems, the imaging of reality. A model is the symbolic, schematic or graphic reproduction of a part of reality.

It is mainly used in the sciences of mathematics and physics, and it is also an integral component of the system of the science of nursing.

Differentiation between the model and the theory is aided by studying the aim. If the aim is to describe or explain something, it is theory. The model on the other hand is the synonym of the conceptual structure, the conceptual system and paradigm, which refers to the global ideas formed about individuals, groups, situations and the cases that are in the centre of attention of the individual sciences, and of which different concepts are made.

Nursing model

The nursing model is the fitting/contacting relationships of facts realized/explored, which, from the aspect of nursing, contains the description of the aim of nursing, its justification, the foresight of developments, or the description of nursing itself.

Nursing models are the shortened forms of nursing theories. The difference appears only at theoretical level. Nursing models are conceptual models, they are constructed by the theories and they project concepts on practical work. They show the correlation of the notions (nursing, health, patient, environment) of the theory and predict the consequences.

Common features, basic values of nursing models

- Holism
- Humanism, anthropocentric view
- Autonomy
- Partnership

Theoretical components of nursing models

Models are made of notions, principles, and concepts. It carries its creator's point of view and suggestions for nursing the patient.

Components of nursing models

- the views, values, perceptions, ideologies,
- definitions of concepts,
- the aims,
- the practical knowlegde.

To sum up, it can be assumed that nursing models:

- are the elements of the caring process and its aim,
- show a uniform approach and device to view the practice, theory, research, management of nursing and the training of nurses,
- offer a mentality regarding nursing,
- are simplified forms of reality which help understanding,
- undertake the description of a phenomenon or a group of phenomena (e.g. people and their energy fields).

The evaluations and criticisms of nursing theories and nursing models

The dividing line between the theory and the practice of nursing is influenced by the reactions of our patients during our practical work. They tell us their opinion, they have individual needs, they may not respond to a treatment as it is described in the recommendations in literature. This way they influence the procedures described in theory, often thought to be perfect.The nurse has to be able to combine general nursing knowledge with his/her own, personal experiences and use them in different situations. This way their professional responsibility increases and the standard of caring improves.

The aim of practice and science of nursing is the same: to provide adequate and quality nursing service. The system of the science of nursing incorporates the complete philosophy of nursing, theories, work in practice, as well as research. If nurses reject the application of nursing theories, the profession will return to its empirical state, nursing will be done on basis of traditions. During the nurse's work, it is not only the activity that counts, but also the way of thinking that lies behind it. What is it that we are doing? Why and how?

The objective of using theories would be to recreate, transform reality. According to the authors, through theories we are approaching a practical science, so the theories must equally contain the final aim and the road leading there.

In nursing science, several different kinds of theories exist which cannot be compared by simple methods, merely by categorization, because the viewpoints of the authors

have changed in the course of time, a different area of focus has entered the centre of their theories (e.g. interpersonal relationships or systems theories). So theories are not static. A certain theory will not change later on (e.g. Virginia Henderson's or Imogene King's theory), but theorizing itself is developing continuously and dynamically (e.g. the appearance of systems theories). On the basis of all these we may agree with Evers' concept (1991), according to which it is inconceivable in nursing that one day a comprehensive theory will be born and it can be applied to solve occurring problems.

The particularities of choosing a nursing theory and a nursing model

One of the basic conditions of successful professional work is that the personnel carrying out nursing should be able to agree on the theory or the model on basis of which they will perform the nursing of the patients. Several factors can aid the selection of the model:

- Considering the characteristics of the patiens to be cared for, e.g. their age, the seriousness of their diseases.
- The period of nursing, if acute or chronic care is done mainly in the department.
- The profile of the department, the type of the institute they work in may also influence it, e.g. hospital, rehabilitation institute, institute for disabled care.
- Confirmations found in literature, e.g. we have heard it, some concepts are familiar, we have already used some components, we know the theory because it has been presented in several publications.

Meleis's criteria (1991) in choosing a theory:

- Personal factors, how much the theory is in accordance with our own concept of nursing.
- How well the creators of the theory are recognized internationally. We may think that the concepts which are widely used, give suggestions to most problems of the people to be attended to.
- Meleis mentions the role of the instructors, mentors, which theories they used as a basis for teaching, what they presented to the nurses.
- The role of recommendations in literature, whatever is more widely known is used by more nursing units.

According to Meleis, both subjective and objective processes play a role in making the choice, and they are equally important in making the decision. After a theory is chosen, in order to decide its efficiency regular evaluation is necessary. This may take anything between a couple of months to severa years to complete

Early nursing theories, their effects, the first experts in nursing theory

Biological – medical (biomedical) model

The biological-medical model (biomedical model) cannot be regarded as a nursing theory, still it is important to mention it. Joellen W. Hawkins, in his publication in 1987, describes the theoretical development of nursing theories and care models. Hawkins starts his review also with the biological–medical model. The aim of the biological-medical model is the reconstruction of biological homeostasis, the curing of the disease. It considers the human organism as a part which consists of anatomical and physiological units. The model emphasises the importance of biological unity and function. The objective is to replace or repair the body parts which are "out of order" in the organism. The patient is not a bio–psycho-social being, but the sufferer of his disease. The basis of the model is made up of medical knowledge (anatomy, physiology, pathophysiology, pharmacology) and scientific knowledge.

The founder of the first model of care theory was **Florence Nightingale** (1820–1910). It is the result of her work that nursing became a profession. In one of her writings („Notes on Nursing"), she formulated the four central concepts: individual, environment, health and nursing. She defined the use of the descriptions of nursing, the nurse's roles and activities, the basics of nursing practice. She described the characteristics of diseases, the importance of the environment. She made a distinction between nursing and medical work and described the connection between the two. Nightingale stood out in nursing as the most prominent figure of her age. The organization of modern nursing practice and the instruction of nursing, the first manifestations of the study of nursing are attched to her name.

Clara Weeks-Shaw prepared the first notes on nursing („Textbook of Nursing") which appeared in 1883. Her theory resembles that of Nightingale's. She described the importance of the nurse-patient relationship, the guidance of patients, and introduced the concept of the 'helper-dependent' in the relationship between the nurse and the patient. According to her, the concept of health is the perfect circulation of clear blood in the sound organism. Disease on the other hand is the loss of this condition.

Isabel Hampton Robb (1907): In her work entitled "Educational Standards for Nurses" she emphasises the importance of the environment: fresh air, the temperature, and the state of the bed linen. She thought both practical work and theoretical lectures (teaching) were necessary in the development of nursing.

Lavinia Dock and **Isabel Steward** published their work which contains their nursing model in 1920. The three components of nursing are described as science, spirit and talent. In addition, they defined the four roles of nursing: preventive, educating, curing and alleviating. They also stated that nursing, regarding its form, can be individual, connected to the family and to the community.

In **Bertha Harmer's** „Text-Book of the Principles and Practice of Nursing" she formulates the objective of comparing nursing theories with practice, also separating theories. She continued to develop the notion of dependence in the relationship of the nurse and the patient. Her first notebook for teachers of nursing appeared in 1926, entitled "Methods and Principles of Teaching the Principles and Practice of Nursing" in which she highlighted that the good nurse is sympathetic, intelligent and skilled. In her opinion, nursing forms a triangle with medicine and other areas of science. She described the use of scientific methods in care, which is the foretoken of the introduction to the nursing process.

Later in their book written together with Virginia Henderson (1955) Harmer described nursing as a service to a person, which helps to achieve and maintain the healthy state of the body and the soul, or if healing is not possible, it helps to stop feeling the sensation of pain and discomfort. The environment is an important influence on health. Nursing incorporates hospitals, clinics, the ward, schools and the home. Health is the lack of illness.

Hester Frederick and **Ethel Northam** (1938) used Nightingale's theory as a frame for their own model in which they extended the scope of nursing to the families of the patients, too. They described that nursing should provide expert physical provision, it should help solve situations, in education and prevention, as well as in making resources available.

Hildegard Peplau (1952) in her book entitled "Interpersonal Relations in Nursing" defined the theory of interpersonal nursing. She described the phases in the relationship between the nurse and the patient and she used different development theories to assess the interrelationship process.

Faye Abdellah and her colleagues, **Beland, Martin** and **Mathenye** listed 21 nursing problems in 1960, which they converted into claims of nursing objectives later on. The theory focuses on nursing rather than describing the role of the patient. They placed the focus on the problems of the patient, which they defined in a subjective and objective way. They concluded that it is often very difficult to find the right solution for the problems of nursing and the patient's problems.

Ida Jean Orlando published a book in 1961 entitled "The Dynamic Nurse-Patient Relationship" in which she described practices taking the basics of nursing into consideration: observation, reporting, fixing, action with the patient or for the patient. She highlighted the nurse-patient relationship, the aims of the nursring activitiy, the role of the patient, and the extent of health. According to Orlando, the nursing process is unique and whatever nurses use during their nursing paractice is based on the behaviour, thoughts, feelings and actions of the patient. The nurse acts based on his own experiences, thoughts and feelings in the nurse-patient situation.

Virginia Henderson's (1964) concept of nursing is based on the needs of the patient. Her greatest contributions to the development of nursing are the concise concept of nursing, the introduction of the language of nursing and independent nursing practice. In her opinion, nursing is a factor which supports the patient by satisfying their needs. She described the nurse as an idependent expert. The definition of health by Henderson is: a whole and sound soul and body. Henderson's work served as a basis for the development of Orem's self-sufficiency concept later on.

Another early expert on nursing theory was **Ernestine Wiedenbach** (1964) who defined the role of the nurse. Wiedenbach regards man as a functional being who has the ability to overcome problems. It is the nurse's responsibility to perceive the conditions of the patient. Nursing contains four components: humanities, purpose, practice and art. Also for arts she defined four components: identification, assisting, confirmation and control.

In 1965 **Myra Estrin Levine** published her own nursing theory. She regards the patient / client as a person who is in the unpleasant state of disease. She highlighted the importance of personality. According to Levine, nursing is based on principles not on rules or procedures. The role of the environment is important, as well as the client's adaptation to the disease. Parts of the nursing process are treatments which can be therapeutic or sustaining.

At the beginning of the 1960s **Lydia E. Hall** interpreted the person as an individual on the basis of three components: the person (core), the body (nursing) and the disease (cure). Nursing touches all three circles, with the representatives of other branches of science (e.g. psychologist, minister, etc.) thus it is in interaction with the complex process of the patient's teaching and learning.

At the end of the 1960s and at the beginning of the 1970s other nursing theories appeared. They are widely kown, popular and often applied today and some of them are going to be discussed here in detail.

Brief introduction of certain nursing theories, nursing models

I. Need theories

Virginia Henderson (1897–1996)

The nursing model based on life operation can be attributed to Virginia Henderson. Her work is an inductively developed theory which emphasizes the patient's achieving independence. She described 14 human needs based on human operation.

By defining the concept of nursing (1964), she definitely distinguished nursing from medicine.

The14 basic needs according to Henderson:

1. normal breathing
2. satisfactory eating and drinking
3. excretion of the waste products of the body
4. motion and taking the desired postures
5. sleep and rest
6. proper clothing
7. keeping body temperature within the normal boundaries
8. keeping the body clean
9. avoiding the dangers in the environment
10. keeping contact with other people
11. practising religion
12. work that gives a sense of success
13. play
14. learning

Besides the 14 basic needs Henderson made two more lists where she enumerated the factors influencing the individual's basic needs constantly or temporarily.

The criticism of the theory is that among the basic needs you can find contact with other people and learning, but there is no proper focus on the patient–nurse interaction or the factors that have influence on it (e.g. anxiety, lack of knowledge about the treatment).

Nancy Roper (1918–2004)

Nancy Roper, Winifred W. Logan and Alison Tierney's work belongs to the group of great theories, the model based on life activities. They took Virginia Henderson's theory of need as a base for their work. Proper life functions are indispensable for maintaining human physiological and psychosocial behaviour. The model emphasizes continuous evaluation of the situation and tailormade nursing. According to the theory, man starts his life with birth and finishes it with death. Through his life, he passes through criteria of dependence and independence, and according to them, man is independent in all respects when he is about 30 (before and after that he is in a dependent situation). The patient must integrally take part in assessing nursing. Man lives his life with 12 basic needs. From Henderson's theory, the need for work and play, and the need for hygiene and clothing are combined. The needs for learning and religion were ommitted. The attitude towards death and satisfaction of sexual needs were added. According to Roper, the patient experiences different activities:

- Life activities
- Preventive activities
- Activities improving well-being
- Money earning activities.

The model was first published in 1980 and at the beginning it was used for teaching purposes among nurses. The model can be divided into two large units: the "life model" and the "nursing model".

Life is a complex process in which 12 activities are defined. They are responsible for survival, and can be called the core of the model.

Life activities are as follows:

1. Maintenance of a safe environment
2. Communication
3. Respiration
4. Food and fluid intake
5. Secretion
6. Individual dressing and hygiene
7. Temperature control
8. Movement
9. Work and play
10. Expressing sexuality
11. Sleep
12. Death

According to Roper, because people can also have current and potential problems, the nurse's task is not merely to manage the existing problem, but also to prevent its appearance, and if the problem cannot be solved with these methods, she should help the patient build a positive attitude.

Dorothea Orem (1914–2007)

The main concepts, metaparadigms of nursing, according to Orem

Man

Orem views man as a whole who consists of physical, psychological and social parts and has varying degrees of ability to self-sufficiency. Human activity is a deliberate action, during which individuals look after themselves and others, recognize the needs and carry out the necessary actions. Normally, man is self-sufficient, responsible and capable of continuous self-sufficiency and providing for relatives.

Health

Orem defined health as the status of man's integrity, which means soundness and wholeness both structurally and functionally. She considers the individual whole who has the necessary ability to self-sufficiency in accordance with the changing self-sufficiency needs.

Environment

She considered man and his environment as an integrated system, which is characterized by interaction. Environment involves all factors that affect the ability to self-sufficiency positively or negatively.

Nursing

Nursing is a direct human, assisting health care service. According to Orem, nursing is a human effort to help other people. Nurses have knowledge about caring and the abilities that are necessary to apply that knowledge.

Nursing is a deliberate line of actions, which consists of activities consciously chosen and carried out by the Nurse. She regarded nursing as an art, social service and technology.

The theory of self-sufficiency

Activities of self-sufficiency are the activities which the person initiates and performs himself maintaining life, health and well-being. With the help of self-sufficiency the individual ensures his own health, well-being, soundness, keeps and develops his own roles. Self-sufficient operation means man's ability to self-sufficiency. It can be modified by basic factors like age, sex, health status, developmental status, socio-cultural background, features of the supply system, family factors, way of life, environmental effects, availability of resources. Self-sufficiency is the individual's learnt, goal-oriented activity. Orem interprets self-sufficiency, self care as a learnable activity which can be learnt through interpersonal relationships and communication. Self-sufficiency can be acquired and practised through learning by mature and developing individuals. Self-sufficiency and providing for the relatives are influenced by cultural elements, which may vary within families, cultural groups and social layers.

Needs of self-sufficiency

From the point of view of nursing, Orem regards man as somebody who needs continuous self-sufficiency and self-guidance through an activity which is called self-sufficiency. By needs of self-sufficiency she means activities which can be performed via self-sufficient acts, and the aim is to ensure the individual's adequate functions, development and wellness on a daily basis, in a stable or variable environment. They are necessary for the accomplishment of self-sufficiency activities.

Therapeutic self-sufficiency need

The totality of self-sufficiency activites is what the individual needs when a general and specific self-sufficiency need has to be satisfied, which corresponds with his status and conditions. The therapeutic self-sufficiency need and its extent changes during the life cycle. The concept of therapeutic self-sufficiency need has three dimensions:

- general self-sufficiency requirements
- developmental self-sufficiency requirements
- self-sufficiency requirements arising from health deviances

Ability to self-sufficiency

It is the responsible, adult individual's complex, learnt ability to be able to manage his own operation and development, to define the components of his own self-sufficiency need (self-sufficiency needs, methods, procedures), and finally, to carry out the planned procedures. Orem distinguishes 10 factors (and calls them basic sustaining factors), which influence the individual's ability to carry out the necessary self-sufficiency:

1. age
2. sex
3. developmental status
4. health condition
5. sociocultural orientation
6. factors of the health care system (e.g. medical diagnostic methods, treatment methods)
7. factors of the family system
8. lifestyle patterns (including everyday activities)
9. environmental factors
10. availability and adequacy of resources

The theory of self-sufficiency deficit

When the person requires self-sufficiency and he can satisfy this need, self-sufficiency is possible. However, if the need is greater than what the individual is capable of satisfying, we talk about self-sufficiency deficit."Deficit" as an expression refers to the deficit between the possibility and the need of sufficiency. The deficit is there if the individual does not have the ability yet, or he is not capable, or he does not want to carry out the necessary self-sufficiency activities or care of relatives (due to circumstances related to health or certain situations). This deficit can be real or potential, complete or partial. According to Orem, complete deficit means that the individual is unable to satisfy his therapeutic self-sufficiency needs. The partial deficit can be expanded or limited to the inabilty to satisfy one or several self-sufficiency needs.

Nursing has to be done if – due to the lack of ability to care – the adult's (or a relative's) therapeutic self-sufficiency needs are not satisfied. This time the need for the activity of self-sufficiency or the care of a relative is greater than the individual's actual capacity for self-sufficiency or the care of the relative.

Orem distinguishes six ways of assistance:

- action instead of another individual
- leading, guiding others
- providing physical assistance
- providing psychological assistance
- providing a supportive, developing environment
- teaching.

The theory of the nursing system

The person's self-sufficiency ability defines to which supportive system he should be enrolled, at the same time it is possible that a person should get into another nursing system.

Orem distinguishes three supportive ways, three nursing systems:

- Completely compensating system
- Partially compensating system
- Supportive-instructive system

The aim of the nursing ability

The broader aim of care, according to Orem, is to compensate or overcome the patient's known or just emerging states different from health, or health-related limitations.

- It consists of three components:
- assisting the patient so that he can carry out therapeutic self-sufficiency actions;
- assisting the patient so that he can move towards responsible self-sufficiency, which has three forms:
- rapidly improving independence in self-sufficiency activities,
- adaptation to self-sufficiency ability deficiencies,
- rapidly declining self-sufficiency abilities;
- assisting the patient's family members or other individuals so that they become competent in nursing the patient while being properly supervised and consulted by a nurse.

Limitations of Orem's theory

The theory of self-sufficiency deficit is not necessarily able to describe all the aspects of the patient's needs. E.g. the exact meaning of "family" is left unclear, so is the connection between the nurse and society. Though the model includes the broader environment, the emphasis is on the individual.

Faye Glenn Abdellah (1919–)

Abdellah considers the type of nursing evident which satisfies the patient's physical, emotional, intellectual, social and spiritual needs. During her caring work, the nurse functions as a problem solver and a decision maker. Based on human needs, she formulated 21 nursing problems (initially, she distinguished 58 nursing problems). Abdellah's typology incorporates three main areas:

- the patient's physical, mental and social needs,
- interpersonal relationships between the patient and his carer,
- frequent elements of the patient's care.

In her nursing theory she directs the disease-centered approach towards the patient-centered approach. Besides the care of the patient she places emphasis on the care of the family members and the elderly as well.

Metaparadigms of nursing according to Abdellah

Man:

An individual using care services, who has physical, mental and social needs.

Health

When the individual is not ill and he has no unsatisfied needs. He is not threatened by real or potential dangers.

Environment

Involves the room, the home environment, the community.

Nursing

Helping attendance, the aim of which is the satisfaction of the patient's needs. Restores or increases the patient's self-sufficiency. The nurse formulates the patient's customized needs in the fields listed below:

- comfort, hygiene, safety
- physiological, balanced status
- psychological and social factors
- sociological and community factors.

She identifies the patient's problem as ten steps, and she considers 11 abilities important in a nurse's work. The theory emphasises the nurse's interpersonal abilities, expertise and communicational ability, so she can provide individual care.

II. Interactionist theories

Ida Jean Orlando (1926–2007)

The main objective of her work is to lay out, organize and apply a system which may help the nurse to develop and maintain her professional nursing and any other skills that serve her cooperation with the people who take part in the patient's care. Her theory focuses on the processes between the individuals, it also regards recognition of the conditions that cause inconvenience to people and their conscious alleviation as its primary aim.

Orlando's theory is built around the concepts of man and nursing.

Man

The individual is regarded as a free human being who is able to express his behaviour verbally and non-verbally. He has individual needs and is able to cope with different situations.

Environment:

Orlando does not define it exactly, but the situation between the nurse and the patient is viewed as a part of it.

Health: is not defined exactly either in Orlando's theory. It might be in connection with well-being and the state of living without mental or physical discomfort. She means it is a kind of sense of comfort.

Nursing

It is viewed as an idependent profession. The nurse applies a caring process to reduce the patient's inability, dependency, sense of suffering, sense of mental and physical discomfort so as to avoid the enhancement of the patient's inconvenience. This way the process of nursing changes dynamically, in accordance with the patient's state. The patient is viewed holistically. It tries to increase the patient's well-being, develop his behaviour and his abilities to self-sufficiency.

According to Orlando, the basic frame of the nurse's attendance means that the nurse learns how to understand what is happening between her and the patient. She believes the nurse serves the patient through what she does or says. The most adequate nurse's activities are those which have a positive effect on the patient.

Orlando's "The Dynamic Nurse-Patient Relationship Theory" focuses on three key concepts whose connection with each other constitutes the nursing theory:

- the patient's behaviour (need, change pointing forward),
- the nurse's reaction (perception, thinking, emotion), and
- the nurse's activity (automatic nursing, conscious nursing) (with three further sub-units: activities, sequence and needs).

Orlando (1961) points out that verbal and non-verbal forms can be present at the same time. It can hinder the maintenance of the patient-nurse relationship and the nurse's work if the patient is unable to communicate his needs towards the nurse effectively. This, however, cannot be neglected, because there might be an unattended need in the background and might signal a request for assistance. Helping of the patient may also make the patient's participation in the nursing process more active. The patient's behaviour induces the nurse's reaction. It is important to evaluate the patient's behaviour exactly – through the nurse's reactions – so that the nurse can a get positive feedback from the patient. The nurse's reactions are as follows:

- the nurse perceives the patient's behaviour through all her senses,
- perception causes automatic thoughts,
- thoughts are followed by automatic feelings,
- the nurse shares her reactions with the patient to find out if her perceptions are correct or not,
- the nurse continuously raises her awareness towards her reactions and feedback received from the patient so that her conscious nursing activities can rather be based on thinking than automatic reactions.

The nurse's activity

The nurse's activity (the activity seen after the nurse's reaction, verbal – and non-verbal behaviour) can occur partly automatically, partly consciuosly.

Everything that the nurse says or does for the patient belongs here (e.g. suggestions, pieces of information, questions, explanations, care of the patient's body, administering medication, treatments, changing the patient's immediate environment).

Ernestine Wiedenbach (1900–1996)

Her theory (1969) became known in the field of maternal and newborn nursing. In 1958 she wrote her classic theory entitled "Family-Centered Maternity Nursing" which is a comprehensive writing about obstetric nursing. The basis of Wiedenbach's perspectivic theory is that the nurse has a central goal that helps her choose proper nursing, also taking the circumstances of the concrete situation into consideration. The professionally recognizable nurse's objectives are clear, she has the necessary skills and knowledge, she is ready to take care of others, she is interested in and committed to her work. According to Wiedenbach, the essence of nursing is to recognize that the patient needs help; to do the necessary attendance and make sure her intervention has been successful.

The three components of nursing theory:

- respect of life as a gift,
- respect for dignity, value, independence and all human individuals,
- commitment towards dynamism in relation with others' faith.

The factors of her theory

- The central objective, which is the nurse's philosophy towards care. Philosophy creates a base for the objective, the objective refers back to the philosophy.
- The realities of the concrete case influence the realization of the central objective.
- The matrix, in which the behaviours, the activities are realized.

Hildegard Peplau (1909–1999)

Hildegard Peplau's originally elaborated her developmental nursing theory for psychiatric nurses. The central element of her theory is the interpersonal relationship emerging between the nurse and the patient.

In 1952, when theories and models were born based on needs, her work had pioneering significance. She described

that nursing is an interpersonal process which contains the helping communication between the nurse and the patient, as well as the joint work to achieve the mutual objective. Nursing, the healing art, helps the patient who needs health care. The nurse seeks to solve the problems emerging in human relationships, because these influence the patient's mental state and anxiety level. Stress causes the individual to become strained and thus energy is released, which provokes personal growth or relapse.

The aim of nursing is the growth of the patient and the nurse through the development of interpersonal relationships. Nursing is regarded as a medicinal interpersonal process in which the primary objective is the survival of the organism, the secondary aim is to help the patient understand the formulation and the process of his disease. Further objectives include the maintenance of health, not only curing of the disease.

On the basis of the developmental model, the steps of the nursing model differ from the other models and theories. Peplau does not talk about situation analysis, planning, implementation and assessment, but about the phase of orientation (situation analysis), the phase of wording (planning), the phase of exploitation (implementation) and the phase of parting (assessment).

The nurse's role in this process:

1. shaping an acceptable atmosphere, building trust,
2. playing the teacher's role,
3. being a resource that has the knowledge and the means necessary for solving problems,
4. counselling, support, technical or psychological assistance,
5. substitute,
6. leader,
7. further roles: functions as a mediator, consultant, researcher.

Imogene King (1923–2007)

King published her interacting systems nursing theory in 1971. The model was formed based on the American nurse's experiences during a research programme. Among others she was keen to find an answer to what the aim of nursing was, how nursing was carried out. On basis of the obtained results, King considered nursing as a process where action, reaction, interaction and transaction appear.

The model is built on four basic systems of concepts.

1. Social systems, as King believes man does not live alone.
2. Perception about objects, individuals, which or who may form the attitude of the patient.
3. Interpersonal relationships. People live in social systems, where they act through interpersonal relationships. These interpersonal relationships are formed based on the individual's perception.
4. Health, which means, according to King, the successful coping with stress.

The objectives of nursing according to King:

- Helping people and groups to maintain, preserve and restore health.
- Sharing usable information which the client can use to improve his status (e.g. giving pieces of lifestyle advice to patients suffering from constipation).
- Providing preventive care.
- Nursing in case of a disease.

III. Result theories

Dorothy Johnson (1919–1999)

The patient's adaptability stands in the centre of the American Dorothy Johnson's behavioural-system theory (1968). She examined how the existing and threatening stress effects may modify the individual's adaptability. The objective of nursing is to reduce stress to aid the patient's recovery. The nurse defines the patient's needs with the help of behavioural subsystems and helps the patient to eliminate adjustment disorders.

The model is composed of seven behavioural subsystems:

1. Behaviour seeking security
2. Behaviour seeking care
3. Coordination of the self and the environment
4. Acceptable nutrition
5. Normal defecation
6. Sexual behaviour
7. Self-protective behaviour

The paradigms of nursing according to Johnson:

Man

The seven behavioural subsystems influence his behaviour and adaptation.

Health

Health is an intangible, dynamic state which is influenced by biological, psychological and social factors. In a balanced state there is no dysfunction. If the balance between the functional and structural subsystems is disrupted, the disease forms.

Care

Joint regulative actions, their role is to preserve the integration of the organism.

The patient's behaviour alters if he is subject to physical, social or biological changes.

Environment

A compound of several factors, which are not part of the behaviour typical to the individual.

Martha Elisabeth Rogers (1914–1994)

In her theory (1970) Rogers puts an emphasis on the further development of nursing science and the nursing profession. She regards man as an integral, whole human being, part of the universe, who is in constant interaction with his environment. One of the keys to the individual's personal development is the result of the constant interaction with his environment. The individual as a system pursues balance, and the whole system responds to a change. She points out that changes in the individual's life processes are inseparable from the changes of the environment. She believes the changes are irreversible, unrepeatable. The integral, whole human being is unique and shows qualities which are more and different than the totality of his parts.

According to Rogers, the aim of nursing is considering the patient together with his energy fields. The changes in the energy fields influence the person's state. If the stimuli arriving from the environment are negative, the interruption of the continuity of the energy fields provokes disease. Rogers emphasized the importance of nursing research, because nursing science can improve this way, but besides this, nursing science and physiological knowledge are essential for successful work.

Myra Estrin Levine (1920–1996)

According to Levine's theory (1973) nursing is none other than the complexity of human interactions. The patient is an integral entity that is in interaction with his environment so as to preserve his energy.

The objective of nursing is to preserve physical and mental soundness with the optimal preservation of energies, as well as facilitating the achievement of wholeness. During nursing the nurse must aim at the optimal use of the patient's resources.

Man is a subject living in interaction with his enviroment. A holistic being, who constantly aspires to achieving wholeness and integrity. A future-oriented, emotional, intellectual being. Assisting adaptation and the maintenance of wholeness is the task of the nurse, recognizing that each man is a unique, different individual. The nurse's role is significant in achieving personal integrity by preserving or rebuilding energies, personal and social integrity. It is worth viewing the individual only together with his internal and external environment. Maintaining homeostasis is of vital importance.

Callista Roy (1939–)

Roy is the creator of the adaptation nursing theory (1975). Due to her theoretical and clinical knowledge and its extensibility, her theory based on adaptation can be applied widely and for a long time.

It deals with three conceptual questions:

- opinion between rationality and science, as well as between the individual and the environment,
- compilation of value-based holism,
- the individual as a participant in the world, who purposefully acts for well-being.

The basis of Roy's adaptation theory is that the person is in constant interaction with his environment. She takes the individual as an integral entity, who reacts and adapts to the changes affecting him. Adaptation may be successful or unsuccessful. The model is of behaviouristic nature, the patient's behaviour and his reaction stand in the centre, as he reacts to the stressors that affect him.

According to Roy human needs have four main groups:

- Physiological needs: work and rest, nutrition, excretion, fluid and electrolyte balance, circulation, thermoregulation and endocrine function.
- Self-image, which contains the individual's beliefs about himself.
- Roles: Roy symbolizes the roles played in social life with a role tree, where the trunk means roles determining long decades, or never changing (e.g. sex, being someone's child or being a mother).
- Interdependence: finding dependence and the state of balance.

On the basis of the individual adaptation zone she defines the totality of stimuli (stressors), to which the individual is able to respond properly. To the stimuli within the adaptation zone everybody responds with positive reactions, while to those outside it, people respond with negative ones. She divides stressors into groups of physiological, psychological and social nature.

The objectives of Roy's nursing theory:

- facilitation of the patient's adaptation to the four main need groups,
- facilitation of behavioural modification if it is necessary,
- knowledge of standards,
- the patient has to be integrally involved in planning.

Knowledge-based nursing, facilitating adaptation is at the centre of the model which is an adaptation sytem interpreting personality. Its aim is to create personal well-being by coordinating the relationship of the individual and the environment. The role of the model is to meet the future's expectations through growth. Roy's work is shaping nurses' scientific culture even today.

System theories

Betty Neuman (1924–)

Still alive today Betty Neuman published her system theory in 1972. In her holistic approach she highlights the physiological, psychological, sociocultural and developmental aspects that surround the individual, taking the different stages of development of human existence into consideration.

Neuman's system theory gives a comprehensive guideline to the uniform realization of nursing practice, research, education and government, where she clarifies the relationship between the different levels of nursing practice, thus emphasizes sustaining the balance between them. The model views the person as an individual who is in close relationship with his environment. So the system consists of two main components: the stressors arriving from the environment and the stress reaction given by the person. Stressors, depending on where they come from, can be

- intrapersonal, from the person's character, attitude, behaviour,
- interpersonal, from the relationship between people,
- extrapersonal, from the greater area of society.

The person continuously reacts to the stressors originating from his environment, so as to maintain his well-being and health continuously. This state is determined by physiological, psychological, sociological and developmental factors. The aim of nursing is to make the person be able to resist stressors at the primary, secondary and tertiary levels of prevention, also, help the patient restore the upset balance. The nurse is present as a caring, cooperative, coordinating expert. So in the centre of the model there is the individual or the group (core) which carries features characteristic to him or them. It has a specific energy source which lessens if the core is threatened from the environment, or if it receives a stressor. Around the core there are defence lines (resistance lines, normal defence lines, flexible defence lines), the task of which is to secure the stability of the core. Defence lines differ according to the individual's development stages, previous experiences, their task is to maintain external and internal balance.

In Neuman's system theory central role is given to prevention, health education and recovery of health. It can be applied to all kinds of health care, it is not limited to nursing, it rather emphasizes multidisciplinary coooperation. With the help of the model the patient's health care needs can be well worded, therefore it can be well applied among patients struggling with mental problems, and also in community care.

Jean Watson (1940s)

Watson's caring and nursing philosophy aimed at reducing the distance between theory and practice.

The philosophy and science of caring

Watson believes that caring is the most valuable activity that the nurse can provide. Her theory is based on assumptions of the science of caring and carative factors (the structural components of the science of caring). She uses the word 'carative' as the opposite of 'curative' of traditional medicine. Watson's carative factors focus on the human dimensions of the nurse's work, and the patients' internal world, subjective experiences. She claims that medicine-related tasks and technologies are always threatening to nursing. Watson's theory of caring offers an opportunity to return to the professional roots of nursing, because in her model she embodies the paragon of the ideal nurse. Her theory not only makes it possible for the nurse to practice the art of nursing, sympathize with the patient/family, alleviate their pain, assist their recovery and preserve their dignity, but also may contribute to the extension of the boundaries of the nursing profession. Using these nursing properties in nursing practice helps maintaining the nurse's health, but it is essential for the nurse to find sense in her work. Watson is one of the nursing theorists who, when making their theory, did not only consider the patient, but also the nurse.

The main characteristics of Watson's theory:

1. She sees nursing as a human science and art.
2. She believes that nursing has to develop its own independent science, concepts, system of relations, methodology, not being connected to traditional sciences.
3. The assumptions of the science of caring and the ten carative factors form the unique conceptual frame of Watson's theory.
4. According to Watson, during the practice of the science of caring the nurse realizes and helps the satisfaction of all the needs in interaction, whose aim is the achievement of the highest state of self-fulfilment.
5. Watson's work is logical, the carative factors are based on comprehensive assumptions which separate nursing from other professions and are logically connected to the hierarchy of needs.
6. Watson's theory is based on phenomenological research which raises questions in general and does not declare hypotheses. Its objective is to describe, analyse and understand the phenomenon.
7. Watson's work can be applied both to the control and the development of caring practice.

Madeleine Leininger (1925–)

Leininger is the founder of the transcultural nursing movement in education, research and practicel. In 1995 Leininger defined transcultural nursing as: an essential area of nursing theory and practice which focuses on personal cultural values. Furthermore, she puts great emphasis on the habits and customs of individuals and groups of different religions with the aim of culture-specific, universal nursing and caring in the field of supporting health and well-being, also when helping people in their unfavourable conditions, diseases, or in death.

Leininger's theory introduces the actions necessary during nursing, which are harmonious with cultural beliefs, customs and values of individuals and groups. At the beginning of the 1960s, she created the expression 'culturally congruent care' which is the primary aim of practical transcultural nursing. According to Leininger, nursing is a learned profes-

sion, and it scientifically focuses on care. Health is a state of well-being, which is culturally defined and is evaluated by the given culture. Preservation or improvement of cultural care: the actions of the carer which help people preserve their values as a part of their culture, and use the values of cultural care in health care.

Culturally competent professional care can be carried out only if it is skillfully embedded into the nursing plan, knowing the client's beliefs and values. Caring is the spirit of nursing. Cultural care guidelines help the nurse implement optimal holistic and cultural care. These practices help the client's self-sufficiency and support his family.

The application of nursing theories in practice

During patient-centered nursing, in a given department or unit, due to the nurses' distinct attitudes, habits and different nursing experiences, a generally accepted theory or model is needed, which guides their activity in practice. If there is no generally accepted model in nursing communities, priorities will not be unified , and due to nurses' differring attitudes conflict might occur. The obviously positive effect of a uniformly used model is that the objectives of care become clear to the nurses and other team members. Nursing work becomes more manageable if the lead nurse clearly defines what they expect from their subordinates. The episodes of conflict between nurses may reduce if they know which tasks and interventions they have to perform. When applying a model, the consent of the nurses is more significant than which model is to be chosen.

The introduction of a theory is more fluent, if it is introduced, managed and realized on the basis of a uniform nursing policy. A nursing team has to go through professional development to be able to work on the basis of a certain theory, they must understand the essence and the aim of the theory, and they must be motivated.

Nursing models define the nursing process. The common principle of every model is the nursing of the patient and helping him in improving his condition, might he fight with problems of either physical or mental nature. Applied theory gives direction in practical work, too. In the following part of this chapter, on account of a common case of ours, we are showing some problem-definitions, setting objectives, and planning of the nursing activity according to some featured models, where we aim at highlighting the main aspects and approach of the given model, regarding the patients' care and the patient-nurse relationship.

A practical example of the appearance of nursing models in the nursing process

Case report

A 55-year-old female patient arrives from her home accompanied by her relatives. She has been treated for diabetes mellitus for eight years. She is taken to the department for the revision of her drug therapy applied so far, also due to the ulcer that formed on her big toe in the meantime. She also reports neuropathic symptoms.

From time to time she experience's probe

Lems with her balance, her blood pressure is usually high (values measured between 150–160/90–100 mmHg), she mentions regular headaches. She does not take her prescribed medication regularly. Her appetite is good, but she says she does not keep to her diet strictly, her weight has increased by 5 kg in half a year, her present BMI is 28. She is constipated and takes laxatives. Her urine is normal, she talks about occassional leaking of urine (incontinence).

Table 1 *According to Virginia Henderson*

Problem	Objective	Nursing activity
Basic Needs		
1. Satisfactory eating and drinking		
Problem: Higher calorie intake than required based on needs.	While she is in the department, the patient should take optimal nourishment into her body, in accordance with her needs.	• the nurse should inform the patient about the proper diet, involving a nutritionist • during the days of orientation she should check if the patient keeps her diet • check the patient's body weight daily • she should carry out blood draws as prescribed by the instructions to check nutritional state and blood sugar levels.
2. Waste excretion from the body		
Problem: The patient often has constipation, urinary incontinence also occurs.	While she is in the department, the patient's excrement and urine excretion should be optimized.	• providing nutrition rich in fibres and fluids • giving laxatives on the doctor's instructions or administering enema • providing incontinency napkins if needed • instructing female intimate exercises (pelvic floor) involving a physiotherapist
3. Movement and taking the desired postures		
Problem: Imbalance, the existing ulcer and neuropathia hinder/limit the patient in her movement	Achieving that the patient does safely implemented exercise in adequate quantity and intensity within three days.	• the nurse should inform the patient about the importance of exercise • continuous motivation • creating safe environment • providing equipment as required • involving a physiotherapist
4. Sleep and rest		
Problem: Factors perplexing sleep (headache, urine leaking) disturb rest at night.	Night sleep should be sufficient and relaxing for the patient while she is in the department.	• providing a peaceful environment • solving continency problems (providing incontinency pads for the night) • giving and documenting the use of analgesic drugs and/or antihypertensive drugs on the doctor's instructions
5. Keeping the body clean		
Problem: Due to her body weight her movement is restricted and so is the satisfaction of her hygienic needs.	Achieving adequate hygienic state right at the beginning of her stay and keeping up this state while she is in the department.	• creating a safe environment • assistance from the nurse in satisfying her hygienic needs (daily shower, washing her hair every 3 days, providing pedicure and manicure weekly) • continuously keeping up the patient's motivation
6. Avoiding the dangers in the environment		
Problem: Due to imbalance and neuropathia the patient is at risk of accidents.	Avoidance of accidents while she is in the department.	• creating a safe environment • in the beginning (for 2 days) the nurse should play the role of a helper, then (for 2-4 days) a supporter, and finally (while she is in the department) a supervisor while the patient is moving • mounting a nurse alarm to an accessible place • teaching the patient how to use the aids safelya
7. Keeping contact with other people		
Problem: The patient lives alone and away from her family, so the opportunity for visits is scarce. It carries the risk that the patient will not have the opportunity to discuss problems with her family members.	Continuous mainteneance and improvement of the quality of family relationships.	• the nurse should encourage the patient and her relatives to have confidential conversations during their visits • the nurse should take part in these conversations if it is needed by the patient and the family • based on the patient's needs, the nurse should sometimes take the role of a "relative"

8. Doing rewarding work		
Problem: The patient feels hopelessness due to her physical limitations.	Elimination of the feeling of uselessness within some hours.	• providing the most frequent conversations possible with the nurse • athe nurse should encourage the patient to always discuss her feelings with her family members, raise questions, talk about possible solutions • in case of a culminative problem the doctor should be informed and a psychologist should be involved
9. Education		
Problem: The patient has incomplete knowledge on her disease, diet and treatment.	The patient should be given enough knowledge on her disease, diet and treatment within 2 days.	• the nurse should provide comprehensive information corresponding with the patient's competencies • the nurse should initiate the involvement of the doctor and other professionals (e.g. nutritionist, physiotherapist) in the patient's education
Always existing modifying factors		
1. age: – middle-aged *2. emotional state:* – normal *3. social and cultural state:* – relatively lonesome *4. physical and intellectual abilitites* – overweight – normal mentality – loss of a certain sense (touch) – mobility impairment		
Pathological states modifying basic needs		
1. injuries: due to her basic disease, a leg ulcer formed on the patient's left leg		

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12. Critical Thinking in Nursing – Nursing Process and Documentation

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The conceptual framework of nursing is defined by the notions of health, humans, environment and nursing itself. The most important definitions of these are collected hereafter.

The notion of health

- "Health is a state of perfect equilibrium" (Hippocrates)
- All functions of the body are in balance with the factors of the environment. Illness occurs when this balance is lost.
- A relative state which means something different for everyone, and it represents a continuous scale ranging from optimal health through disease to death.
- "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being. The health of all peoples is fundamental to the attainment of peace and security and is dependent upon the fullest co-operation of individuals and States. Governments have a responsibility for the health of their peoples." (Constitution of the World Health Organisation, 1946)
- A perpetually and dynamically changing state of balance made up of several factors.
- Periods of different qualities follow each other in every human being's life, which bring along changes in the biological, psychological and social dimensions, and the change is uneven.
- "A healthy person is somebody who can react to the environment effectively, health is the state which is the most frequent statistically." (NATURALIST approach)
- The definitions of health and disease depend on how the individual or the society judges them. (NORMATIVIST approach)
- "Health is a condition that allows people to fulfil their own needs without any specific effort." (HENDERSON)
- "The state of maximum independence that allows people to do daily routine activities without assistance." (ROPER)
- "A level of emotional conditions at which interpersonal activities and improvement aims are." (PEPLAU)
- "Health and disease are inevitable dimensions of a person's life" (ROY)
- "A value – as defined by individuals and cultures." (ROGERS)

The notion of individual/person/human

- "An individual is someone who has universal basic humane needs that he can fulfil on his own when he is healthy." (HENDERSON)
- "A living organism for which self-fulfilment is very important and who pursues equilibrium but only achieves it by death. Humans are physical, psychological and biochemical systems." (PEPLAU)
- "A biological, psychological and social being that is constantly in interaction with a permanently changing environment." (ROY)
- "A unified, dynamic whole, something more and other than the sum of the parts. An open system in constant interaction of material and energy with the environment. The course of his life irreversibly proceeds to one direction. Development takes place within one spatial-temporal unit. Humans are characterised by the capacity for abstraction, language, thought, perception and emotion." (ROGERS)
- "Man is an open system continuously interacting with his environment, adapting, growing, developing, pursues independence – independence is a dynamic state that can change any time." (ROPER)

The notion of environment

- "Four-dimensional, space and time exist, and the individual exists within them. The changes of human life are inseparable from the changes of the environment, the individual and his environment seek a harmonic unity." (ROGERS)
- „Interpersonal environment, others' microcosm is important." (PEPLAU)

The notion of nursing

- "A caring vocation with services for the well-being and health of people" (ANA)
- "Those activities of the nurse that contribute to and maintain health and recovery of a patient, that alleviate

suffering, and – if life cannot be sustained any longer – contribute to peaceful death." (CNA)

- "The unique function of the nurse is to assist the individual, sick or well, in the performance of those activities contributing to health or its recovery (or to peaceful death) that he would perform unaided if he had the necessary strength, will or knowledge." (HENDERSON)
- "A logical problem solving process, assisting people in solving and preventing and living with problems of daily life. Nurses help from conception to death. The individual must be empowered and assisted to achieve maximal independence." (ROPER)
- "The task of the nurse is to satisfy patient's needs in a personalised way, nursing is a service to society. Nursing is needed whenever a problem arises and the patient is unable to solve it independently." (ABDELLAH)
- "A process of interpersonal relations, helping art." (ICN)
- "Caring for the individual as a whole. Profession, art and science. One of the most important things is to maintain and promote health and to prevent illness and to care for and rehabilitate the sick and the disabled. The interaction of humans and environment must be taken into account and make advantage of it. The practice of nursing must be based on research, and nursing needs to co-operate with other disciplines." (ROGERS)
- "A fundamental human activity of individuals, families and societies with or without help from professional healthcare workers. In its organised form it is a distinct healthcare discipline the knowledge of which distinguishes it from other disciplines. Science and art – it requires understanding, knowledge and skills typical of sciences." (WHO)
- "It covers the biological, psychological and social fields of life, since these affect health, illness and death. The science of nursing employs the knowledge and technology of physics, biology and medicine to improve its own knowledge and technology. Its main task is the promotion, maintaining and protection of health, caring for the rehabilitation of the individual, caring for the sick, the injured and the dying." (WHO)

The nursing process

The main element in the improvement of health sciences, and specifically of nursing science is the actual professional application of the nursing process in everyday practice. Keeping an accurate written documentation corresponding to the changes in the patient's condition is a significant part of the implementation of the nursing process. Nursing care plans provide a framework for the practical realisation of patient care. Nursing process is a logical and systematic problem solving process.

Phases of the nursing process

1. *Assessment* – description of the problems of the patient based on the assessed information. Its process is the following: identify the problem; identify the causes of the patient's health problem if it is known; assess how the patient reacts to said health problem. E.g. *Epigastric pain occurs due to known gastric ulcer. The patient reports poor condition and sharp pain, to which he/she reacts with fear and anxiety.*

2. *Nursing diagnosis* – the analysis of collected and classified data in order to identify the patient's complaint. E.g. *Epigastric pain due to known gastric ulcer.*

3. *Planning* – Planning involves the prioritisation of already made diagnoses, the establishment of the goals to be achieved, the description of expected results, the selection of activities and the construction of a nursing care plan based on all these. E.g. the goal: *Pain should be reduced to bearable for the patient within two days. Defining activities: Assess the patient's pain on the visual analogue pain scale. Indicate the assessed level of pain in the documentation. Provide the patient with the prescribed analgesics. Provide some distraction relevant to the patient's interest, and comfort tools as well. Indicate the result assessed with the pain scale in the documentation both before and after administering analgesics.*

4. *Implementation* – performing interventions, satisfying needs according to priorities. The aim is to implement the nursing plan described in the previous point. After the plan is made in accordance with the patient's needs and the priorities, the nurse carries out specific interventions which can be:
   - Dependent
   - Independent
   - Interdependent

   Nursing interventions are based on elaborated protocols and rules entirely. The process of implementation:
   - reassessment of the patient's condition
   - providing and preparing equipment
   - personal conditions
   - preparing the patient both psychologically and somatically
   - performing of the intervention
   - comforting the patient
   - waste disposal, adequate treatment and disinfection of equipment

   E.g. *The level of the patient's pain is 8 on the visual analogue scale, due to which 1 amp. No-spa intravenous injection was prescribed besides therapeutically adjusted medication, which was administered and documented by the attending nurse. 30 minutes after the administration of the analgesic injection the value of pain reduced to level 4 on the scale. Analgesics were administered twice more in the same fashion during the day. 24 hours later the analgesic was administered in pills. Asked by the patient, the nurse positioned the patient in Fowler's (semi recumbent) position then checked the position and gave assistance to the patient several times during the day. The nurse visited the patient frequently and initiated conversation to distract the patient.*

5. *Evaluation – an element applied in each phase of the nursing process.* Evaluation assesses the changes in the patient's condition and reactions to nursing interventions in the light of the goals with the help of the outcome criteria. Another aspect of evaluation is the assessment of the quality of nursing care. E.g. *Outcome criteria: the patient should mark level 1 or below on the visual analogue scale. Pain should not hinder the patient in daily activities. Documentation of evaluation: 36 hours later the patient judged pain tolerable, and defined level 1 on the visual analogue scale. The patient's mood improved, and talked to the nurse and to other patients readily.*

Practical realisation of the nursing process

The steps of the nursing process are transformed into an applicable form and into the documentation by the nursing care plan which includes several columns. The literature is uniform concerning the steps of the nursing process, but varies in practice. It must be mentioned that 4, 5, 6, 7 … etc. column nursing care plans are used.

Nursing documentation and its forms

Nursing documentation is an important part of clinical documentation. Proper nursing documentation is a prerequisite of professional patient care and efficient communication contributing to co-operation of team members. (Ammenwerth et al., 2001; Davis, 1994; Sahlsedt, 1997)

The definition of healthcare record:

All data related to the physical, mental and psychological condition and pathological state of the patient; to the circumstances and cause of death reported by the patient or any other person or obtained by the healthcare system via recognition, examination, measuring, or derivation; and any other data related to or affecting the above (e.g. behaviour, environment, occupation).

The aim of handling healthcare and identification data
- promoting the protection and sustenance of health
- contribution to the efficient healthcare activity of the attending healthcare professionals
- keeping track of the patient's health condition
- implementation of measures necessitated by the interests of public health and epidemiology

Healthcare and nursing documentation

Healthcare documentation includes all notes, record, or any other recorded data related to the healthcare and identity of the patient, which is obtained by the healthcare service provider during the performance of healthcare services. Keeping the documentation is not optional; it is required by law. But it is not only an obligation under law, it is also a demand of quality control. Besides legal regulation the rules included in the Manual of Hungarian Healthcare Standards [Magyar Egészségügyi Ellátási Standardok; MEES] and the internal regulation of individual healthcare institutions must be taken into account as well.

Act CLIV of 1997 on Health: "The patient shall have a right to complete information" thus the healthcare service provider shall document „all data and facts that can influence treatment outcome".

According to the law nursing documentation shall be kept as a part of the healthcare documentation; "Nursing and caregiving shall be documented in nursing documentation, which shall form a part of the healthcare documentation".

The Act XLVII of 1997 on the Handling of Medical and Other Related Data; and the decree No. 62 of 1997 of the Minister of Health points out that "healthcare data are confidential, confidential information shall not be disclosed." "Healthcare documentation shall be kept for a minimum of 30 years from the date of recording; discharge summaries shall be stored for 50 years." Healthcare Standards [Magyar Egészségügyi Ellátási Standardok; MEES] also have a significant influence on the nursing documentation system of individual institutions. In the process of hospitalised patient care, standards related to patient admission, patient check-in, examination, medication, therapy, transfer, referral, discharge and death affect nursing documentation the most significantly.

Concerning admission *and check-in,* MEES points out that healthcare service providers shall keep proper and complete documentation of each patient according to the legal and professional regulations in effect, which must be handled with regard to aforesaid regulations. Healthcare documentation shall include personal data for the verification of patient's identity. The identity of the patient must be verified prior to each examination and intervention, especially before medication, blood transfer, the administration of blood preparations and surgical intervention. Documentation should reflect the entire healthcare procedure accurately, in an organised way and in chronological order. Healthcare employees must record the date and time of notes related to service and

the documentation must be signed. Patient documentation must be made accessible to everyone taking part in caregiving. Patient documentation contributes to coordination among individual units. The documentation – together with all related records – must be kept even after discharge.

Healthcare documentation must contain unambiguous information about the following:

- Results and conclusions of assessment and diagnoses;
- Planned care, treatment methods, their outcome;
- The patient's condition, changes in condition, complaints;
- Performed examinations and interventions and their outcome.

Elements of patient documentation:

- identification data,
- name/contact details of the person/legal representative to be notified,
- anamnesis, medical record,
- results of the first examination,
- results of examinations based on which treatment plan is established; date and time of these examinations,
- the disease indicating treatment, primary disease from which it originates, secondary disease, complications,
- disease and risk factors not indicating treatment directly,
- time/outcome of interventions having been performed,
- pharmaceutical or other therapy applied and its outcome,
- allergy/hypersensitivity to medicines,
- name of the persons that recorded information/date and time of,
- the contents of information provided for the patient/other person,
- the fact and time of consent/refusal,
- any other fact and data that can influence treatment outcome

As parts of patient documentation, the following also must be kept:

- examination findings,
- documentation of therapy and consultation,
- nursing documentation,
- diagnostic imaging records,
- tissue samples

Parts of patient documentation/healthcare documentation

Medical history is the document containing the institutional data of the patient. It consists of the medical record, temperature chart, laboratory papers and insets. It includes the personal details of the patient (name, place and date of birth, address, occupation, ID number, name of the closest relative). Anamnesis also constitutes a part of it, and it can be individual, family or social anamnesis. Medical history also includes the status praesens (the present condition) and the progress note recording the progress of the disease, which includes the findings and changes in condition recorded during examination, monitoring and therapy. The epicrisis/patient care summary is the short summary of the medical history, which also includes further recommendations and instructions concerning therapy. Temperature chart is usually kept only in in-patient institutions.

The keeping of the temperature chart (bedhead board chart)/medical chart is a task of nurses and physicians, which can be divided into eight main parts. It allows for keeping track of the daily patient care process. It gives information about the examinations, medication and basic laboratory parameters of the patient.

Section 1

Data for patient **identification** (name, age, occupation, date of admission)

Section 2

Indication of **date** (year, month, day). Sundays and (public) holidays are marked with red (Table 1)

Section 3

Prescribed **examinations** (e.g. thoracic X-ray, gastroscopy).

Section 4

Therapy. Indicating the names and administration method and dosage of medicines is the physician's task, while indicating administration itself is the task of the nurse who has administered medication. It is essential to indicate the measurement units after the name of the pharmaceutical, since some preparations are available in several forms (e.g. Amlipin pills are available both in 5 and 10 mg dosages).

Dosage also must be indicated after the name of the pharmaceutical. 3x1 means that the patient receives a dose once in the morning, at midday and in the evening. 2x1 means in the morning and in the evening. 1x means once a day, either in the morning or in the evening – it depends on the prescription of the attending physician (e.g. Rawel 1,5 mg morning, 1 pill).

Abbreviations: In case of injections ampoule is abbreviated as amp., capsule is caps., suppository is supp. , drops are abbreviated as gt. (gutta). In case of pro re nata (p.r.n. 'when necessary') it is up to the professional nurse to decide when to administer medication, depending on the patient's condition.

The continuation of medication is indicated by a straight arrow, discontinuation is marked with two slanted parallel lines. The prescription of infusion solution also belongs to this section in a form suitable for the hospital ward. (Table 2)

The fact of administration may be marked in several ways; e.g. with a vertical arrow drawn next the horizontal one and the initials of the attending nurse.

Section 5

Diet column, where the prescribed diet is noted (e.g. LM stands for light mixed diet)

Section 6

Cardinal symptoms such as respiration, blood pressure, pulse and temperature are given in a progress chart. Depending on individual institutional properties, these can be distinguished with colours. (In some institutions respiration curve is marked with a broken line). On the temperature chart a horizontal red line can be drawn at 37 °C, i.e. at the upper limit of normal body temperature so that pathological values stand out clearly. The units (squares) of grid represent different values in case of different vital parameters (Table 3)

Section 7

Body weight. (Ideally body mass would be indicated, since weight is a vector quantity. Its value depends on the distance from the centre of the Earth, on gravity. On the other hand, mass is a scalar quantity independent from gravity.)

Secretions, bodily discharges – the amount (ml) and form of stool, expectoration and vomitus can be documented.

Physiological stool is marked with a vertical line, diarrhoea is marked with as many slanted lines as the times it occurred. If no defecation occurred a day, it is marked with a crossed zero. Enema is marked with its initial. A red capital M stands for melaena.

In case of expectoration the amount of sputum found in the spitting mug in millilitres, e.g. 20 ml. If haemoptoe/ hamoptysis occurs, it is marked with a red capital H.

If vomiting occurs, the amount is indicated, in case of vomiting blood it is marked with a capital H (for haematemesis).

Under the **fluid** section the daily fluid intake is to be indicated. This must include the amount of soup ingested besides water, tea or fruit juice, and if the patient receives infusion or transfusion therapy, the amount of solutions also must be indicated. Their amount is given in ml; e.g. 01/14. fluid: 1300 ml.

The amount of **urine** is divided into day and night amount. It is given in millilitres.

Section 8

The results of blood and urine tests are indicated on the left side of the chart (Table 4). It is to be noted that in some institutions this section is not filled in, but the printed laboratory evaluation sheet is attached instead.

The height of the patient is indicated below the area for laboratory values.

If the patient receives intensive or sub-intensive care, the chart is not divided into 24-hour but shorter, even one-hour

Table 1 Indication of year, month and days on the temperature chart

2011th year, month 01., days	14	15	16	17

Table 2 Documentation of medication

	14	15	16
Medication	Ampilin 10 mg 2 × 1 tbl.	⇨	⇨
	Bicatlon 50 mg 1×	⇨	⇨
	p. r. n. Ibuprofen 200 mg	⇨	
	Ringer lactat 2 × 500 ml		

Table 3 The value of 1 square in indicating cardinal parameters on "old-type" charts

Vital parameters respiration	Respiration	Blood pressure	Pulse	Temperature
Value of 1 square	1	4 Hgmm	2	0,1 °C

Table 4 Hungarian abbreviations for blood and urine tests on the medical chart

Urine		Blood	
fs	density	Wa	Wassermann reaction
vh	pH	Vvs	red blood cells
a	albumin	Hb	haemoglobin
p	pus	Fvs	white blood cells
s	saccharose		
ubg	urobilinogen		
bil	bilirubin		
aceton	acetone		
ül	sediment		

sections due to more frequent checks and medication dosages.

Erasing, deleting data on the medical chart is forbidden. If any correction is necessary it must be carried out in a clear and obvious way. The incorrect note must be crossed only once, and it must be signed by the person that corrects it.

Before ward walks and conferences or consultations the medical chart must be prepared as a part of patient documentation.

Visits, ward-walks, consultations/conferences

During visits/ward-walks the members of the caregiving team listen to the patient's complaints standing next to the bed, the physician performs the necessary physical examinations and prescribes further therapy and examinations depending on the patient's condition. Ward-walks can include the following:

- *Nursing ward-round:* daily or weekly, depending on the service provider unit. Nurses assess the patient's problem related to health condition.
- *Ward physician's visit:* the physician obtains information on the patient's condition in order to be able to refer about it and to adjust therapy according to any changes in the patient's condition.
- *Physician in attendance's ward-round:* after the end of the day-shift the physician in attendance assesses patients' condition during the evening hours, and if necessary, modifies prescribed medication in order to prevent any deterioration in condition.
- *Head physician's ward-round:* usually once a week; attending physicians inform the head physician about the condition of their patients next to the sick-bed.

It is important to gain information about the patient's condition before ward-walks.

Physicians' consultation

A meeting and consultation among physicians from different fields who survey the patient's condition and make suggestions for further treatment. The patient and the entire documentation must be present at the consultation.

Regulation of access to healthcare documentation in Hungary

The patient/the patient's legal representative is entitled to know relevant healthcare and identification data, can have access to medical documentation, and can obtain a copy of them at his/her own cost.

- In case of the patient's death his/her legal representative/close relative/inheritor is entitled – on written request – to gain access to healthcare data related to the cause of death and to medication and therapy performed prior to death; to gain access to medical documentation and can obtain a copy of them at his/her own cost.
- During a patient's lifetime, or following his death, the spouse, a lineal kin, a sibling or common law spouse shall have the right to become acquainted with the health care data, upon written request, if the data in question is required in order to identify a reason that might influence the life or health of the spouse, a lineal kin, a sibling or common law spouse or provide healthcare to these persons, and there are no other ways to get acquainted with such data.

What are the obligations of the physicians and healthcare workers?

Both those that are handling or processing data are bound to secrecy. Healthcare data are confidential. Any healthcare or personal data learned while providing healthcare services, or data related to health care or any other data are to be regarded as medical secret. Other physicians, healthcare professionals, medical students, etc. may be present during providing healthcare services with the patient's consent. Healthcare documentation shall be kept for a minimum of 30 years from the date of recording; discharge summaries shall be stored for 50 years. The requirement for confidentiality shall not cover cases in which the patient or the legal representative of the patient has given a written release, or for which statutes specify an obligation to provide said data. The institution is reliable for the protection and keeping of healthcare and identification data.

Nursing documentation

Nursing documentation reflecting the outcome of healthcare service is an official legal document detailing the patient's progress through the medical/nursing process, and giving an account of its outcome.

Nursing document – accurate, hand-written or electronic information about the patient – includes the notes of the healthcare workers about the entire and continuous nursing of the patient. According to the above mentioned regulations, healthcare staff is obliged to keep this documentation. The professional nurse is reliable for conducting his/her own nursing practice, and this reliability includes documentation as well. The complete, accurate, regularly kept nursing documentation justifies that the professional nurse has met requirements and has acted reasonably and carefully. Incomplete and insufficient nursing documentation may affect the outcome of the healthcare service provided for the patient negatively.

Documentation that is in accordance with statutory and professional requirements reflects holistic care, personal and professional support of patients and their families. Keeping proper nursing documentation is a time-consuming process.

According to decree 48 of 2009 (XII. 29.) of the Minister of Health the primary goal of keeping nursing documentation is to reveal the nursing needs and the demand for care of the patient via systematic data collection. After that nursing tasks can be planned and performed nursing activities can be documented. Nursing documentation enables safe nursing practice – with sharing information relating to the patient. Up-to-date information is available concerning the changes in the patient's condition, it can be followed progressively, care is unobstructed even if healthcare staff is changing around the patient. The entire process of nursing becomes clear-cut through nursing documentation. It gives comprehensive and dynamic information about the changing needs of the patient so that he/she can receive adequately personalised care. The accurately kept nursing documentation enables safe professional communication, the obvious identification of the reliabilities of attending nurses, and the evaluation of nursing care. By the identification of reliability care can be given account for since it justifies if a task was performed by a professional nurse. Nursing documentation through the evaluation of related nursing interventions provides a rich source of information for the improvement of nursing practice. Comprehensive and accurate documentation means a solid basis for enhancing the quality of care and for the evaluation of outcomes. It may make the arguments for demands of source redistribution realistic. It also may play a role in planning time management, gives an opportunity for comparing the nursing practice of different healthcare institutions and for the reducing the risks occurring during care. It can serve as a basis for the continuative training of the staff and for the improvement of the efficiency of team work. All these can make nurses more contented (e.g. positive feedback from clients/patients, time saving resulting from organised work).

It provides nursing managers with an opportunity for monitoring the quality of nursing and costs, the rationalisation of workload, the justification of improvements needed in nursing with data, and for meeting the requirements of regulations. Accurate documentation makes it possible to keep track of the cost of interventions, it can prove the rate of nursing achievement in the entire healing process, and can result in a more rationalistic and cost-conscious nursing attitude.

Accurate documentation also provides opportunities for nursing research. It may contribute to the improvement of research practice based on facts.

Care becomes transparent from the point of view of nursing education through nursing documentation, individual decisions become traceable for students, the reason for activities becomes justifiable with data. It may motivate students. Although nursing documentation primarily serves the interests of patients/clients, nevertheless it can provide legal protection for the nurse in disputed cases.

The details of nursing documentation are determined by the legal regulations of each country, the professional requirements of individual institutions, the nursing model applied by the institution and the profile of the ward. According to annex No. 5 of the decree No. 48 of 2009 (XII. 29.) of the Minister of Health comprehensive and partial nursing documentation are to be distinguished between.

Comprehensive nursing documentation reflects every element of the nursing process and includes the notes made by all healthcare workers performing nursing and caring activities (Source: annex No. 5 of the decree No. 48 of 2009 (XII. 29.) of the Minister of Health)

Partial nursing documentation does not reflect every element of the nursing process and/or does not include the notes made by all healthcare workers performing nursing and caring activities (Source: annex No. 5 of the decree No. 48 of 2009 (XII. 29.) of the Minister of Health). Nursing documentation needs to reflect professional specifications (e.g. active, chronic care, adult or minor patient).

General guidelines for the keeping of nursing documentation

- Nursing documentation must reflect the individual stages of the nursing process and who performed what, how and when and why during the process.
- Nursing documentation should only contain data related to the nursing process.
- The documentation shall be comprehensive, i.e. whatever the nurse performs, observes, notices or measures must be recorded. All that is not documented, legally did NOT happen during the process.
- Documentation must be objective even when errors occur during the process.
- Always record facts.
- During taking the anamnesis, defining the nursing diagnosis, planning, implementation of the planning and evaluating of the process the participants of healthcare must be continuously informed.
- The patient and the patient's family shall be regarded as active partners in the process.
- It is important for the documentation to contain the events taking place during the process (interventions,

etc.) in a chronological order (even in minutes, if required).
- Each entry must be preceded by date and time.
- It is a requirement of nursing documentation that is should not increase the administration burdens on nurses, it should be user-friendly and practical, easy to use and other members of the team should obtain information from it easily.
- All events must be documented by the person that recognised, diagnosed, measured or performed it.
- Documentation should be brief, accurate, objective, and complete and include all significant information.
- Documentation should be continuous, organised and logically structured.
- Wording should be brief, comprehensible and technical, ambiguous or mistakable expressions should be avoided.
- Mistakable abbreviations should be avoided. Use accepted abbreviations only.
- Each activity and nursing intervention must be signed by the nurse who performed it.
- Nursing documentation must be kept with devices providing clear, eligible and permanent writing (in ink or with computer, etc.), and handwriting must be eligible as well.
- Do not use pencil, only pen.
- In case of errors the general rules for the correction in documents must be clearly identified. *(annex No. 5 of the decree No. 48 of 2009 (XII. 29.) of the Minister of Health)*
- The documentation can include only objective comments which are free of personal judgement, and which do not offend or put blame on the patient. It is important to record facts instead of personal opinions or suppositions.
- It is useful to document events right after their occurrence – when the nurse can recall them well.
- The correction of documentation errors must be signed and dated.
- Electronic data recording has convincing advantages, but they also require ensuring data protection and the identification of the recording person.

Nursing documentation techniques

Narrative style

Story-like documentation of the client's condition and nursing activities. Data are recorded within the process of nursing, without any structuring frame.

Problem Oriented Medical Record (POMR)

The problems conceived by the healthcare team are recorded with the application of the framework of the nursing process. It enables more effective data collection and requires continuous evaluation of the nursing care plan. Its advantages are that it makes problems seen through the patient's eyes, facilitates efficient communication among members of the healthcare team, and ensures the continuity of care. Information can be surveyed easily, in a chronological order.

SOAPIER

A structured form of documentation based on the application of the SOAPIER formula.

S: subjective client data provided by the client
O: objective data from caregivers, nurses, etc.
A: assessment, understanding the client's problem
P: planning, goals, measures, counselling
I: interventions
E: evaluation
R: revision

The PIE notes are recorded in the nursing documentation
P: Problem
I: Intervention
E: Evaluation

- The problem has been solved.
- The problem has decreased.
- The problem still exists.

Focus charting (DAR)

After recording the event/problem in the focus of the documentation the nurse describes the findings, nursing interventions and the client's reactions related to the event with the DAR structure (data, action, response). This form of documentation is client-centred and facilitates efficient communication.

The elements of DAR are the following:
- defining the event in focus (nursing problem, nursing diagnosis),
- recording subjective and objective data (Data), signs, symptoms, the client's behaviour;
- nursing interventions (Action);
- responses and condition of the client/patient (Response).

Charting by Exception (CBE)

A form of documentation developed in order to reduce documentation errors. It reduces the risk of repetitions, it saves time for the nurse, the client's condition can be identified within a short period of time. Only data different from normal are identified. Charting by exception assumes that the healthcare unit applies standards and protocols that is the reference to the fact that only exceptions are recorded.

Computer assisted charting

The nurse records notes with a computer, so data can be retrieved more easily. Electronic medical charts are widely used in European healthcare. However, the integrity of data and the protection of personal data have increased significance in this field. The International Organisation for Standardisation, or ISO covers the topic of the promotion of secure data storage in two new documents, and it defines internationally co-ordinated directives which are useful to be taken into account concerning future improvement. In the nursing process the security of the patient is of primary importance, but at the same time the satisfaction of users is a determining factor, too.

The *ISO / TS 21547:2010 document* published in March 2010 gives a summary of the security requirements of archiving electronic healthcare records. It is essential to observe these directives for the secure long-term storage of healthcare records. The *ISO / TR 21548:2010 document* gives an account of practical methods and means by which security requirements can be met.

Electronic documentation offers an opportunity for re-using data besides recording events and organising data.

Source documentation

The various professionals taking part in the care of a patient keep their documentation on separate charts, in chronological order and narrative style.

Multi-professional medical documentation

All professionals taking part in the care of a patient keep their documentation of the patient on the same chart.

Flowsheet nursing documentation

Data and activities are documented according to the formal requirements and structure of documentation. It is the most widespread form in Hungary.

The compulsory minimum of the content of nursing documentation in Hungary – according to annex No. 5 of the decree *No. 48 of 2009 (XII. 29.) of the Minister of Health* – is the following:

Identification data

The patient's personal data
- last name and first name
- maiden name
- date of birth (year, month, day)
- official and residential address
- social security number (társadalombiztosítási azonosító jel; TAJ)

Data for the identification of the location, date and time of healthcare and the attending person responsible for care
- the name or number of the institution, department, ward and bed
- the time of admission, transfer or discharge of the patient (date, hours, minutes)
- the name of the nurse(s) admitting and discharging the patient
- the names of the nurses actually attending the patient according to the actual shifts/schedules

Data related to patients' rights
- identification of the person to be notified if necessary (name, contact details)
- in case of patients whose mental capacity is impaired/limited, the name and contact details of the person in the possession of patient rights/other rights relating to the patient
- if a patient has no, or limited mental capacity, the parent's/legal representative's agreement declaration concerning the rules of the institution, nursing interventions and handling data for the purpose of healthcare
- if a patient has no, or limited mental capacity, the parent's/legal representative's declaration of the agreement/refusal of using a patient identification wristband

Data of the nursing assessment
- the time of taking the nursing anamnesis (date, hour, minutes);
- factors which affect nursing significantly: somatic and psychological symptoms/complaint/condition, social conditions, lifestyle, nourishment, diet affecting the patient's health and nursing significantly;
- the degree and fields of independent (self-reliant) activities;
- significant damages in health;
- data referring to endangering conditions

Assessment of the patient's nursing needs
- collected data must be analysed and interpreted on the basis of the data of the assessment of conditions
- the patient's nursing needs must be defined
- these must be recorded in the nursing documentation
- if the patient's nursing needs or the patient's reactions to the health problem change during the process, it also must be recorded in the nursing documentation, together with the date and time of the change

Nursing planning
- the goals and expected outcomes of nursing need to be defined in a measurable way, based on the patient's nursing needs;
- nursing interventions must be selected specifically, in accordance with the former aspects.

Data related to the implementation of nursing interventions

From the data of nursing interventions based on the *dependent functions* of nursing and prescribed by the attending physician in the diagnostic or therapy plan:
- prescribed nursing interventions must be named accurately, with obvious technical terms

The following must be indicated:
- the prescribed/intended time of implementation
- the name of the nurse performing the nursing intervention

- the actual date of the nursing intervention
- any significant data related to the intervention and observed by the nurse, extraordinary events, and the data of related nursing interventions

From the data of nursing interventions based on independent and/or *interdependent functions* of nursing the following must be indicated:

- the accurate and technical naming of the intended/implemented nursing intervention
- the date of the nursing intervention
- the name of the nurse performing the nursing intervention
- any significant data related to the intervention and observed by the nurse
- any extraordinary events related to the intervention, and the data of related nursing measures

Evaluation of nursing

The summary of the nursing care plan in the nursing documentation contributes to the evaluation of the nursing process. Final nursing summary written at the end of the process gives a brief summary of the nursing process, and includes the discharge plan which gives further information and suggestions to the nurses continuing the patient's nursing care in another healthcare unit or level about the subsistent and expected needs of the patient.

The advantages of keeping nursing documentation

It provides comprehensive and dynamic information on the changing needs of the patient/the patient's family, so that the patient/the patient's family can receive personalised nursing care.

However, critical opinions about the nurses' documentation obligation also are heard. The overburdened nurses in healthcare units operating with limited and insufficient staff feel that it takes time away from nursing care. It is also phrased sometimes that anything can be written on paper, but it is not significant what is indicated this way. However, it is not to be disputed any more since it is regulated by law. If a nurse does not record the necessary data, or the data recorded is not true, it may involve legal and ethical consequences. At the same time it can be stated that in the lack of human resource and other infrastructural conditions it is extremely difficult to keep such documentation that reflects patient-centred nursing and is based on the nursing process. It is equally important to document nursing correctly and accurately for the interest of patients/their relatives, nurses, all the healthcare and social care professionals and the future generation of nurses.

However, developing the methods of the nursing process, the preparation and training of the nursing staff for this method, developing, introduction and continuous improvement of the necessary documentation are time-consuming processes which require financial and human resources and dedication as well.

Possible future improvements: electronic nursing documentation

The significance of electronic communication in healthcare

Electronic communication and storage of data related to healthcare is a continuously increasing need in the healthcare system (e.g. financial management and quality control, patient record systems in inpatient and outpatient care, diagnostic fields – e.g. laboratory, diagnostic imaging, etc.).

The key of this process is the improvement of the IT infrastructure in healthcare, a prerequisite of which is data standardisation. (Goossen et al., 2004)

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13. Introduction to Examination of Patients

BY GÁBOR NAGY M.D.

Healthcare workers and students participating in public health (hygienic) training applied only a few basic physical diagnostic methods earlier. The demands of our age, the expansion of competence levels make it necessary that more detailed knowledge, skills in connection with patient observation are to be obtained besides different treatments. The ambulance officer's on the spot examination at an adequate level is indispensable to establish diagnosis and to start primary care. Besides this, it is also necessary to expand the knowledge of nurses in this respect because of the great variety of duties, specialization and control of these duties, which require a detailed assessment of the patient's condition. Acquiring these skills, the special workers can render aid to make an early diagnosis and can accurately assess the patient's condition. All these together can result in the patient's speedy recovery and in the improvement of his condition.

It is important to put an emphasis at the very beginning on the fact that we make the most of anamnesis (history taking) and physical methods of examination if on the one hand we often use them (Practice makes perfect), on the other hand if we profoundly acquire clinical subjects (e.g. surgery, internal medicine, neurology) later on. According to several surveys in western countries, skills acquired and obtained in this way, and practised appropriately can prove just as reliable and valuable in establishing diagnoses as if performed by physicians.

This chapter includes the procedure and typical features of anamnesis, necessary for diagnosing the most common diseases currently, as well as the performance and evaluation of physical (without instruments) methods of examinations in details regarding the body organs. So the circle of potential illnesses can be restricted significantly; moreover the physical methods of examination performed appropriately facilitate to establish diagnosis.

First Encounter with the Patient

Perhaps, the initial evaluation of our patient's health condition is the most difficult task, as we do not know about their previous health problems and we have to gain their trust in us in order to be able to define their condition as accurately as possible.

To gain the patient's trust is important because it determines basically the efficient co-operation, diagnosing, efficient therapy and the patient's further way of life.

Obtaining the patient's confidence must be taken seriously from the very beginning.

Seeking treatment from a doctor, health care worker is generally preceded by a process in the patients, taking several factors into account.

These factors can be very diverse but the severity and deterioration of the complaints, including pain, as a symptom being present, is the one that especially contributes to turning to a doctor.

When making anamnesis, the fact that the patient can withhold his complaints, as well, to avoid putting him on the sick list, can be a vital influencing factor. To have some knowledge about the complaints and to take them into account is important in order to render the best care for the patient and to cause him the least difficulty as far as possible.

Further influencing factors are dealt with in details by medical sociology.

Communication

The below mentioned reports the process and the characteristics of the communication between a patient in quite good condition and health care staff. Unlike this, in case of a patient being in critical condition, to avoid threatening consequences, obtaining information takes place more quickly, and is restricted to the basic knowledge until his condition improves.

Firstly, it must be emphasised that appropriate communication has a positive impact on the process of confidence, and it improves the patients' health condition. To gain the patient's confidence we should consider the followings as far as possible:

Appropriate preparation

The scene of the communication between the health care staff and the patient can have an impact on revealing the patient's complaints and the consequent patient examination.

In an ideal case, a quiet, personal room should be provided for the appropriate communication, which is easier

to create in a private surgery than in a hospital. In a hospital other staff (e.g. students, resident physicians) can be present so it may be necessary to introduce them in this case.

Take care of your appearance and behaviour. Clothes contaminated with discharge, lack of hygiene and inappropriate attitude can have a negative impact on the communication and create a poor first impression..

Introduction

It is important to introduce yourself and to listen to the patient's name after greeting him, making eye contact with him. Its importance is really significant at the first encounter from the patient's and from every staff member's point of view, as well.

Paying attention to the problem

If it is possible, ask the patient why he came to see us, what complaints he has. Use open questions at the beginning of the conversation/defining his condition as the patient reports the complaints which are important for him, the obliteration/treatment of which is important for appropriate quality of life.

The first step is 'active listening' – this is considered best practice. The duration of active listening lasts for a few minutes, and it outlines in which direction to continue the conversation. The main complaints should be revealed in details (e.g. What is your chest pain like? How could you describe it?), clarify the questions important for you (e.g. Does the chest pain radiate to somewhere else?)

The patient must be interviewed about – besides his present complaints – several, common symptoms of diseases as getting older he can have several health problems. If you do not know his medical history, it is important to identify the potential abnormalities of other body organs. Sometimes these diseases can interact and make the process worse.

The existence of the following symptoms/complaints must be identified in the course of a detailed surgical and internal medicine examination

- breathing
- cough, sputum
- chest pain
- oedema
- faeces,
- urination, its characteristics
- sleeping
- pain
- appetite
- vomiting
- change in weight
- temperature, fever

Anamnesis (medical history)

Establishing anamnesis or history helps us place the patient's condition/health problem into an appropriate 'milieu'. It helps to identify that the given condition is a part of a process or perhaps, it is an independent health problem occurring for a shorter period.

Establishing anamnesis usually takes place after listening to the patient's main complaints.

As usual, the recollected memory of the patient makes up the anamnesis, it is called *autoanamnesis*, the history collected about the patient and/or the circumstances of the problem from another person, is called *heteroanamnesis*.

Heteroanamnesis can be obtained from other health care staff, from parents in case of children, from relatives in case of a mentally disturbed (confused) patient. It is important if the anamnesis cannot be collected from the patient not to let the relative leave – if he is present – until the heteroanamnesis has been established, so he can stay by the patient during the entire period of examination.

The types of anamnesis

Anamnesis can be classified according to its types as medical history takes into account several living conditions of the patient in order to get an accurate picture.

- social anamnesis
- family anamnesis
- job or occupational anamnesis
- anamnesis regarding sexual life, sexual functions
- pharmacological anamnesis

As the living conditions and milieu of the patients have a great impact on the development of health problems, to investigate them is of extraordinary importance. It has been well-known for a long time that the development and process of several health problems depend on the patient's living conditions, social status etc. In the course of social anamnesis the below mentioned should be asked:

- financial circumstances
- marital status
- education
- address (type of the place where he lives/ distance from the health care facility)

Revealing *addictions* is also very important. Addictions conventionally include alcohol-, coffee consumption, smoking, the conscious consumption of other legal and illegal substances having an effect on health.

Occupational anamnesis means a way of anamnesis closely related to the previous one.

In this case the role of potential occupational factors in the development of health problem is investigated and not the financial consequences.

Information about the patient's previous health problems is also important for assessing the present condition. Mainly health problems that might have caused chronic lesions, injuries such as accidents, operations, childhood diseases, chronic diseases (diabetes, hypertension, chronic bronchitis) have to be asked.

Family anamnesis means mapping health problems closely within the family.

When establishing family anamnesis health problems, causes of death mostly in the circle of lineal descendants and ascendants (parents, children, brothers and sisters) should be revealed.

Questions concerning sexual history are asked mostly in case of female patients, except health problems belonging to urology, andrology when male patients must be asked, as well.

Pharmacological anamnesis relates to the patient's current medication. At this time ask him what kinds of medicine, how many, how long are taken and if he has experienced any problems in connection with medication. Pharmacological anamnesis is of vital importance as omitting it might result in serious consequences such as overdosing, allergic reactions.

Pharmacological anamnesis must cover not only the medication prescribed by the doctor previously but all the medication, curative preparations, products taken by the patient.

Besides this, in each case the patient must be asked about his medication allergies known so far (hypersensitivity) to avoid more severe potential consequences. This information must be indicated apparently in the patient's documentation so that all further health care workers should recognize and be aware of it.

On the basis of all these, listening to the patient's complaints and establishing anamnesis can relatively take a long time, especially for the first time. Later on during visits and other encounters only the events, changes having happened since the last encounter must be learnt about.

Documentation

After establishing anamnesis, it is important to carry out precise documentation. When writing down the patient's complaints, we must aim at writing the patient's complaints in his own words literally. Not only should the supposed (hypothetical) specific diagnosis be recorded. Good documentation is clear cut, it contains the patient's complaints in details, previous health problems, the medication taken by the patient as well as the information related to them. Documentation administered this way is also useful for colleagues to observe details of the patient's previous condition and it is also a legal document, and may have importance in cases of complaint or negligence. In our own defence, it is necessary, as well, that all the important information should be confirmed in writing.

Summary, suggestions

Finally, we have to clarify what the important details for us are and sum up the differences that we recognised for the patient. We should strive to report these facts tactfully, in an appropriate way, for the patient. We must tell him briefly , professionally and quietly, our opinion ensuring we maintain effective eye contact.

The Bases of Physical Examinations

Methods of physical examinations include using our sensory organs, to examine without instruments. Physical examinations play an important role in making a diagnosis, besides modern imaging, laboratory tests and other diagnostic alternatives, and there importance should not be overlooked.

The process of the patient's general inspection is the following:

- interviewing the patient about his current complaints
- establishing anamnesis
- physical examinations
- laboratory tests and instrumental examinations

General internal physical examinations and their respective evaluation are to be dealt with in details in the subsequent part of the chapter.

Four basic methods of internal physical examinations are used conventionally for the examinations pertaining to the lesions of the respiratory, cardiac, vascular, abdominal organs.

- inspection
- palpation
- percussion
- auscultation

Unlike this, the methods of neurological patient examinations can be classified according to the main parts of the nervous system:

- looking for cranial, spinal and meningeal excitation signs
- examination of cranial nerves
- examination of operation of sensory system (sensorium)
- examination of equilibrium and coordination of movements
- examination of higher sensory functions (consciousness, cortical functions, psychic functions)

Detailed neurological examination is not described because of its greater extent.

Inspection

Inspection starts at the moment when you observe the patient. Observe appearance, build, and movement while the patient is approaching, sitting down in the room, perhaps his body position in bed or in the wheelchair. In many cases these signs may help to establish diagnosis significantly.

First impression is always important and the more experienced the examiner is, the more information he can obtain. First impression combines our intuitions about the patient and the complex of previous experience.

Sometimes decisions must be made, founded on the first impression, if the patient is in a critical condition and perhaps urgent treatment is required.

Inspection is naturally performed in details when the patient is made to strip as far as possible, paying attention to his sense of prudency.

Skin

After taking off his clothes the lesions on the skin can be observed at first. The most common reasons for the abnormalities in colour which can be seen systematically on larger areas of the skin are the following:

- anaemia – because of reduced level of haemoglobin
- cyanosis – because of reduced level of oxygen
- icterus – accumulation of bilirubin
- sediment of iron (haemosiderosis, haemochromatosis) etc.

These lesions are significant although their precise reasons can be clarified only after a more profound examination in many cases. After the observation of the skin the inspection starts from the top (head) working down to the lower limbs.

The region of head-neck

When inspecting the eye from an internal medical point of view, the position of the eye in the orbit (protruded, sunken in), vascularity of retina, colour of sclera can be recognized. Lesions regarding vision such as pupil abnormalities, eye movement disorders are discussed in details by neurology.

From among the organs on the neck the inspection of the thyroid, the shape of larynx and its position in the medial line, and the pathologically enlarged lymph nodes can be important.

Breasts

Breasts must be observed thoroughly in cases free from complaints, as well, their shape should be compared in the patient's lateral and upright position. Also the skin of the breasts with any retractions, changes in colour, condition of mammillas and areolas of nipples should be inspected and documented .The details concerning the inspection of other regions of the body will be discussed in details according to the organ systems.

Palpation

In the course of palpation lesions situated close to the body surface on the human body are searched and the processes (e.g. feeling the pulse) taking place in the body are examined.

In the course of routine internal examination the following are palpated:

- peripheral pulses (radial, dosalis pedis, tibialis posterior arteries), in the lack of them look for them centrally (carotid, femoral, brachial arteries)
- the characteristics of the skin (warm-cold, dry-wet, painful-painless)
- oedemas
- lymph nodes
- thyroid
- breasts
- maximal impulse (apex beat)
- chest expansion, vocal fremitus (pectoral fremitus)
- abdomen

In connection with feeling the pulses we refer to the previous knowledge.

In the course of palpation the different body regions, the areas identified painful by the patient must be felt (palpated) but the painful areas must be examined last for the sake of better diagnostic assessment.

Oedemas can occur because of inappropriate operation of several organ systems, although in every case the following must be observed:

- if the localisation of oedema is corresponding gravitational circumstances
- if it is symmetrical (especially in case of limbs)
- if it retains the imprint of your finger tip after pressure is applied
- As oedemas most frequently occur on lower limbs, therefore the differentiation of lower limb oedemas can be significant. They can be classified according to:

oedemas occurring in unilateral form

Reasons: Thrombophlebitis, deep vein thrombosis, erysipelas, lymph circulation disorder

oedemas occurring in symmetrical form

Reasons: heart failure (cardiac insufficiency), renal insufficiency, change in blood structure, liver disease (hepatopathy)

The examination of lymph nodes

In case of inflammation or other disorder of an affected organ, the lymph guided from the given area contains several pathogens/inflammatory substances which cause response in other regional lymph nodes and as a consequence of this, they may enlarge and become painful.

In normal cases the sound lymph nodes cannot be palpated.

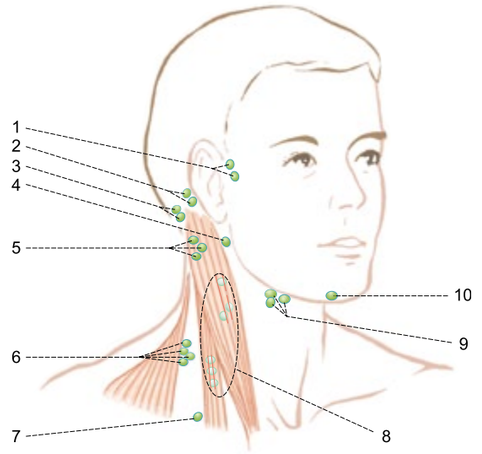

Figure 1. (lymph nodes situated in the head-neck region) NOT OWN, but modified
Note: 1. pre-ear, 2. post-ear, 3. suboccipital, 4. under the ear, 5, 6 superficial cervical lymph nodes parallel with nutatory muscle 7.supraclavicular, 8. deep cervical lymph nodes, 9.submandibular, 10.submental

When examining lymph nodes the following must be taken into consideration:

- the localisation of the lymph nodes, the number of the affected lymph nodes
- the symmetry of the affected lymph node / on how many body regions they can be found
- the mobility of the affected lymph node, its relative position to setting

Palpation of thyroid

Palpation of thyroid can take place standing opposite or behind the patient. The organ is generally palpated by the finger tip of fore-, middle-, ring finger of both hands so that we should place our finger first on the patient's thyroid cartilage, then starting sideway from there, we look for a glandular palpated area. The peripheries of the thyroid and by this its size can be determined by palpating the glandular area in all directions. In the course of examination we must pay attention to the potential painfulness, the quality of the palpated area, different consistency/callosity of the substance, potential nodules. The examination is finished by the inspection of the mobility of the patient's thyroid when swallowing (during deglutition). If any of the above-mentioned is abnormal, further examination is needed.

Palpation of breasts

As part of a routine internal examination has only informative importance, it requires thorough inspection only if the patient's complaints are localised on this region. In case of female patients they are routinely examined in course of gynaecological examination. The process of palpation is similar to the movements and their order in the course of self-palpation.

Percussion

Guidelines for percussion

In the course of percussion one hand is placed on the patient's part of body for percussion and have the middle finger closely pressed on it, while you strike on the middle phalanx of the middle finger of the hand placed on the patient by the distal phalanx of the middle finger of the other hand (Fig. 2)

The sound produced in the course of percussion can be affected by several factors:

- the air content of the percussed organ (one of the main defining factors)
- the size of the percussed area
- the intensity of percussion
- the intensity of the pressure of percussing finger on the patient's chest
- the structure of the areas above the percussed organ (the structure of chest and abdominal wall)

It is important to know that percussion is not / or rarely carried out on the bone/ or bony area in the course of internal examination, as because of its solidity, vibrations are reflected so no information is obtained concerning the condition of the organs lying deeper.

In the course of percussion the resonances produced on the body surface advance to the deeper layers of the body, and then they are reflected partially or wholly from the different border surfaces (from the border of density differences, the border of organs). These reflected resonances are perceived and assessed as different sounds.

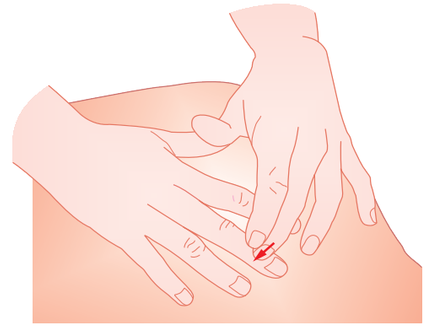

Figure 2.: Performance of percussion

On the basis of all these, three basic sounds are distinguished:

- dull
- tympanic
- resonant

In the course of percussion these sounds and their changes are assessed, so the borders of particular organs (lungs, heart, spleen, liver) can be determined this way, among others. Besides this the change of sound, typical of the specific organ, may indicate health problems.

There are two main types of percussion:

- Topographic percussion, the aim of which is to estimate the borders of different organs (most often heart, lungs, liver, spleen)
- Comparative percussion, the aim of which is the recognition of differences perceived in the organs located in symmetrical position (almost exclusively it refers to the lungs).

Auscultation

Several forms of auscultation have been used, but in general it means the recognition of sounds – by means of stethoscope /binaural stethoscope – coming from a smaller area. These sounds originating from normal or pathological processes in the body can be different according to the specific organs, so they are discussed in details in the specific chapters.

In the course of auscultation the examination is carried out by the head of the binaural stethoscope (or its bell-shaped or membrane structure) placed on the body surface.

Try to exclude other distracting factors such as external noise, or noises caused by hair or muscle movements.

The processes mentioned below may produce sounds in normal circumstances in the body:

- the quick air flow in the bronchi
- the wall of alveolus resonated by air
- the opening and closure of cardiac valves
- rumbling sounds generated by intestinal movements

The examination of cardiovascular system

Most heart problems do not cause any symptoms at the beginning of the progress of disease. The most important symptoms of heart disease are:

- thoracic discomfort feeling /pain
- dyspnoea (difficult breathing)
- palpitation, tachycardia
- sudden loss of consciousness for a short time
- oedemas

The performance of physical examinations is determined by the patient's general condition in every case. Urgent treatment is primary in severe conditions, predicting circulatory failure, only after the relative stabilization of the condition is the detailed patient examination possible.

The following order of examinations is applied only with patients in haemodynamically stable condition.

Besides the recognition of the mental and general condition (despondency, difficult breathing, weakness, cyanosis, oedemas), the blood pressure of the patient's is an important parameter.

Inspection

The inspection of patients is important from the point of view of identifying cardiac condition, although only the symptoms of severe heart failure (difficult breathing, cyanosis, oedema, vein jugularis, protruding externa) can be detected. The change of pressure in the big aortas close to the heart and their symptoms may help us. Besides pulsation felt on the artery, the examination of venal pulsation may help us determine the pressure of the systematic circulation.

Palpation

Palpation – in the same way as inspection – is of relatively less importance concerning the heart.

The change in the location of apex beat (point of maximal impulse) indicates the change in the location of the heart.

Murmur caused by a more severe disease of cardiac valves can cause vibration on the thoracic wall which can be palpated. Their location and typical characteristics are similar to the murmur identified during heart auscultation.

In case of mainly young patients having chest complaints, thoracic/close to thoracic muscles, joints can be involved, in

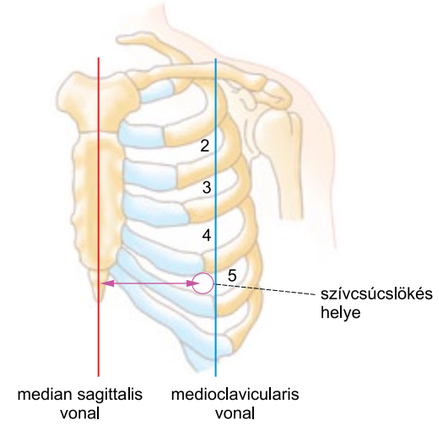

Figure 3. The point of maximal impulse (PMI or apical pulse), 5 intercostal space on the left side, just one transverse finger to medial from the midclavicular line (Not own, labels are modified)

this case the complaint is the consequence of an earlier physical stress. So it is advisable to palpate the thoracic muscles thoroughly, looking for sensitive or painful regions on the chest .The real ischemic chest pain cannot be determined (detected) as a well-defined point on the chest.

Percussion

The primary aim of the percussion of the heart is to estimate the borders of the heart.

Naturally the anterior thoracic wall section must be known and it can be seen on Figure 4.

Knowing the normal borders of the heart is important as the tapped border must be compared to them.

Cardiac dullness

When tapping the heart on the anterior thoracic part dull resonance can be heard above the heart, which is called cardiac dullness. It can be divided into two groups:

- *absolute cardiac dullness,* which is the part of the heart touching completely the thoracic wall
- *relative cardiac dullness,* which means the actual size of the heart, which provides information about the portion of the heart covered by the lung, as well.

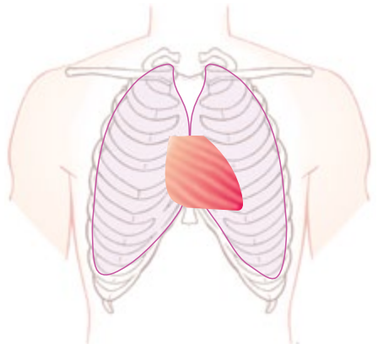

Figure 4 The anterior thoracic wall section

Percussion on the borders of the heart is performed in lying position of the patient.

In case of a heart with normal healthy size and location, the dull resonance is expected from (slightly to medial of) the midclavicular line slightly towards the medial.

Figure 5 displays the order of percussion. *(1st video – http://tamop.etk.pte.hu/apolastan/english.html)*

Auscultation

Heart auscultation (normal heart sounds and murmurs) is one of the most important methods of physical examinations of the heart. In the course of auscultation above the heart, the operation of heart valves can be estimated. Besides this – especially in pathological cases- the friction

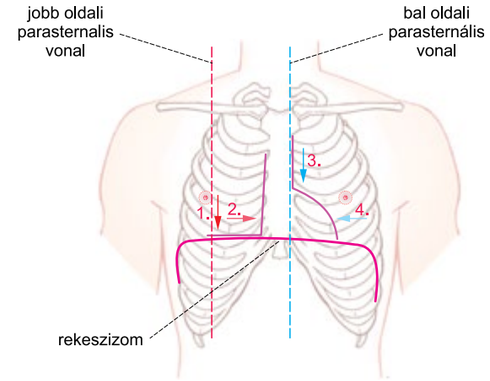

Figure 5 The order of percussion of heart borders Initially, we move in the right midclavicular line (1) from the scapula downwards until we reach the diaphragm (liver) dullness. Then we move on the right side above the diaphragm towards the medial until the border of the sternum.
Then we move on the left side close to the sternum (parasternally) downwards, until we reach the upper border of the cardiac dullness. Then on the left side we move from the axillary line to the medial above the diaphragm until we reach the apical dullness of the heart.
The increase in the normal borders of the heart is often the consequence of heart dilatation (enlarged heart) and is to be considered pathological in all cases.

murmurs of the defects of septum and pericarditis can be detected.

The auscultation points above the anterior thoracic wall are also called punctum maximums, which are the exact examinational locations of the function of each cardiac valve.

Figure 6 comprises the exact auscultation points of different cardiac valves. *(2nd video – http://tamop.etk.pte.hu/apolastan/english.html)*

In the course of auscultation above the punctum maximums the opening and closing sounds of the different valves are observed.

1. First (S1) or systolic sound is the sound heard when the aortic valve opens and the mitral valve closes.
2. Second (S2), diastolic sound is caused by the aorta or the pulmonary valve when they close as well as when the mitral valve opens.

S1 sound is a bit louder and lasts longer in a healthy person than S2. Normal S1 and S2 sounds last for a short time and between them there is no murmur.

While performing auscultation strive to estimate S1 and S2 sounds, which are important guiding points. In comparison with them, the extra sounds auscultated are called murmurs. (Figure 7) + *recording, 1 normal, 1 systolic and 1 diastolic murmur. (sound files: http://tamop.etk.pte.hu/apolastan/hangok_english.html)*

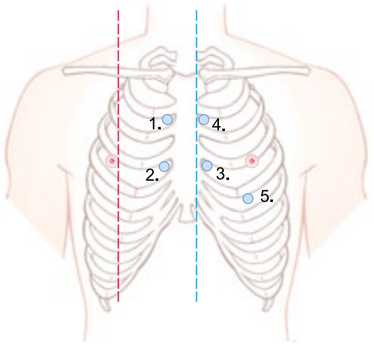

Figure 6 The punctum maximums of the heart (the auscultation points of the heart)
1. aortic valve: II. intercostal space just at the right border of sternum (because of the aortic arch it must be examined on the right side)
2, 3. tricuspid valve IV. intercostal space at the right or left border of sternum
4. a pulmonary valve: II. intercostal valve right at the left border of sternum
5. mitral valve in the V. intercostal space on the left side 1 to 2 cm to the medial from the midclavicular line.

In normal conditions the patient's cardiac sound, especially when the borders of the heart have been tapped previously, can be estimated in lying position, although it can be done in sitting and standing position, as well. In some cases the heart sound and murmurs can be heard more precisely if the patient turns to his left side.

You should strive to listen to the heart sounds at the expiration phase so that disturbing breathing sounds can be excluded. In certain cases the patient can be asked to hold his breath for a while.

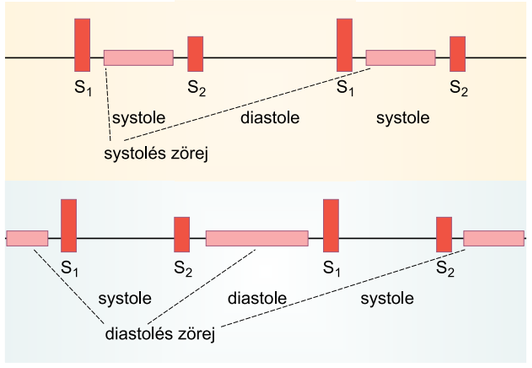

Figure 7 The systolic (S1) and diastolic (S2) sound, the location of the pathological systolic and diastolic murmur

Heart murmurs

If a sound can be detected besides the normal S1 and S2 sounds, then it must be a murmur. Several features of the murmurs must be defined such as the duration (systolic or diastolic), character, intensity, the most audible location, the location of transmitted murmur.

The development of murmurs is affected by valve disorders as well as blood viscosity and the speed of circulation. In case of healthy valves you can encounter some murmurs which develop because of the above-mentioned causes and remain until they are settled.

Examination of respiratory system

The symptoms of respiratory diseases often comprise dyspnoea, cyanosis, cough, sputum discharge and thoracic pain. Accessory muscle use of respiration (sternocleidomastoideus, serratus anterior, abdominal muscles) can often indicate more responsively that the patient is expected to do extra work to obtain sufficient quantity of oxygen.

The symptoms of respiratory diseases are far too general, showing overlaps, so a more accurate diagnosis can be obtained only by the complementation of physical/instrumental examination of the lungs.

Dyspnoea can be defined in several ways, perhaps the most comprehensive definition is that when the patient is aware of breathing (it is conscious) and experiences it as a subjective sensation / difficulty- it is called dyspnoea.

The features of breathing difficulty might be important for us so the following must be made clear:

- When does breathing difficulty occur?
  - *In rest*
  - *Loading (how much loading)*
  - *Due to some external factors (e.g. allergens)*
- How long does it last?
- Is it spontaneous or it ceases after therapy?
- How much does it restrict our everyday activities?
- Is it accompanied by other symptoms like cyanosis, accessory muscles use?

Inspection

Initially, inspect the patient's whole chest, observe the existing, potential thoracic deformities, then thoracic deviations and their symmetry should be estimated.

Thoracic deformities

Thoracic deformities, especially the more severe sideway curves of the spine (scoliosis) often affect the thoracic vertebra and by this modify the run of the ribs. Scoliosis is often accompanied by the fact that the ribs on the one side of the chest get too close to each other, so they obstruct the breathing movement.

The deviations of the chest are often so visible that at first sight they suggest certain respiratory diseases. Barrel chest is a typical feature of pulmonary emphysema (a common chronic respiratory disease).

The movements of thoracic muscles

Observe respiratory movements, use of accessory muscles of respiration (sternocleidomastoideus, pectorals, abdominal muscles etc.). In case of severe progresses of disease (e.g. severe bronchial asthma) powerful contractions can be seen in the intercostal space during strained inspirations. Generally these contractions can be observed more clearly in the lower intercostals spaces. In the circumscribed areas of the chest- especially because of the injury caused by trauma- one circumscribed chest portion moves counter direction with the whole chest during breathing (paradox breathing).This paradox movement is caused by the negative intrathoracic pressure .

The type of breathing

Measure the duration of inspiration and expiration (in a healthy individual the expiration time is longer), so the inspiration and/ or expiration difficulty of the patient can be observed.

The inspiration difficulty suggests upper airway narrowing (trachea, main bronchi), expiration difficulty can indicate narrowing of the lower, smaller bronchi so the location of the disease can be concluded from the inspiration- or expiration difficulty.

The differences in the rate of breathing, the change in its type as well as characteristic types of breathing have been discussed in previous chapters so they are not dealt with in details here.

Palpation

The deviations of thoracic organs, especially of the lungs and adjacent pleura can already be differentiated by palpation.

Palpation of the chest informs us about the following:

- Looking for painful areas
- The size and symmetry of thoracic deviations
- Pleural friction murmurs (mainly in case of pleurisy)
- Pectoral fremitus (thoracic vibration)

By palpating the chest the location and intensity of thoracic pain can be defined and it offers assistance if you consider the possibility of potential locomotor disorder in the background of the complaints.

The examination of pleural friction murmurs

Your palm is placed on the patient's chest and your palm feels the potential pleural murmurs during breathing. As several components can affect the intensity/sensation of pleural friction murmurs, it is advisable to place your palm on different areas, as the murmur can be felt best above the affected pleura portion.

Pectoral fremitus (PF)

Pectoral fremitus is the complex of vibrations felt on the thoracic wall which are developed during the patient's talk, move along the trachea-bronchus system and finally are conducted on the thoracic wall.

In the course of examination your palm is placed on the chest (generally on the back, under the scapulae) while ask the patient to say 99. Saying 99 vibrations are detected, mainly their symmetry is observed above the two lungs.

It is important to state at the beginning that PF assessment is rarely of diagnostic importance by itself, although it facilitates to clarify the differences obtained by other physical examining methods.

In case of healthy individuals pectoral fremitus can be palpated symmetrically, however, its intensity can be affected by the condition of the lung and the thoracic wall, the voiced intensity of the spoken word, sex (in case of males it can be felt better because of the deeper voice).

The performance of pectoral fremitus is displayed on Figure 8

It can be seen in the above picture how vibrations are conducted towards the thoracic wall in normal cases.

The reasons for unilateral decrease of PF:

- the accumulated fluid or air in the pleural laminas
- thickening of pleura
- vibrations are not spread (blocked) for some reasons in the bronchial system
- thicker thoracic wall

The cause of PF decrease is the reflected waves from the marginal surface of the pleura as well as the presence of the inappropriate medium in the lungs, so fewer vibrations get to the thoracic wall.

The causes of PF unilateral increase:

- pneumonia
- atelectasis (lack of air in the lungs)
- other process infiltrating the lungs

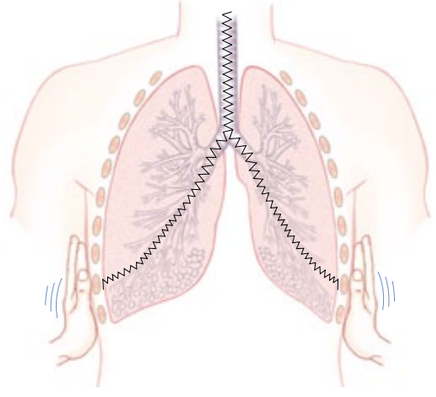

Figure 8 The performance of pectoral fremitus.
The patient says 99 while you place both your palms on the chest above the lungs and observe vibrations. In case of normal lungs the intensity of the thoracic vibrations on both sides is the same.

The reason for the increase of PF is the presence of a medium which has denser tissue than the lung which intensifies vibrations and so the vibrations getting to the thoracic wall are stronger.

Figure 9 displays the mechanism and the reasons for increased and decreased PF.

Percussion

Percussion is one of the most important methods of the examinations of lungs. In the course of percussion the resonance is significantly affected by the condition of the thoracic wall and the underlying organs, mainly the repletion of lungs with air.

The basic principles, having been discussed in the introductory part in details, are applied in the course of percussion of lungs.

When percussing pulmonary apex your finger is placed on the upper border /margin of the patient's trapezius muscle and move from the acromion (lateral) to the occiput (medial). In the course of percussing resonant, not tympanic percussion note sound can be detected above the middle portion of the muscle in 2 to 3 transverse finger breadth.

After percussing pulmonary apex , omitting the scapula, move downwards keeping fingers in intercostals spaces until resonance, typical of lung (resonant, not tympanic) turns to dull. The border, between the two, marks the diaphragm, the inferior border of lung. The height of the inferior border of lung is generally determined in comparison with the height of the corresponding thoracic vertebra. In normal conditions inferior portions of lung on the back can be found at the height of the 10th thoracic vertebra. Perccussed borders should be judged in comparison with this normal point.

Topographic percussion is described on Figure 10. *(3rd video – http://tamop.etk.pte.hu/apolastan/english.html*

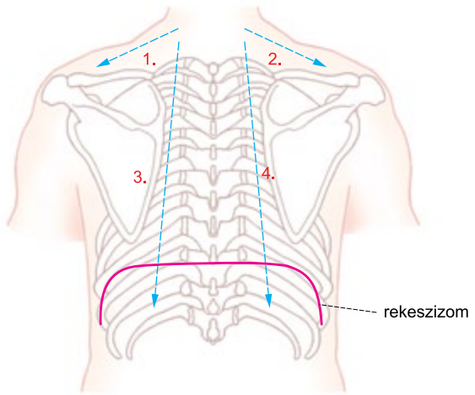

Figure 10 Topographical percussion order of the lung

In case of comparative percussion percuss above the same points of lung/chest and compare resonance.

Percussion sounds

Percussion sounds of healthy lungs are called *full, sharp, resonant, not tympanic*. Pathological percussion sounds can be divided into groups according to the classification in the introductory part. Percussion sound becomes duller by decrease of air content of lung as well as in conditions accompanying pleural fluid collection. In conditions when free air occurs between pleurae or the air content of lung significantly increases, resonance becomes *tympanic*. In case of pulmonary emphysema (lung enlargement) resonance becomes hollow.

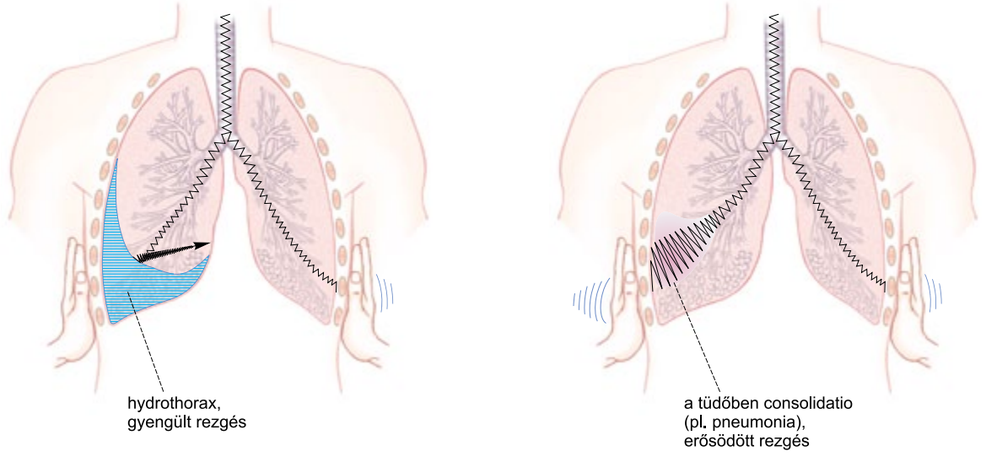

Figure 9 The mechanism of PF decrease and increase

Auscultation

In the course of auscultation instruct the patient to take a deep breath with his mouth open while you can listen to several points superior to lung, generally symmetrically. Auscultation can happen on the posterior (on the back), or anterior of the chest, but the localization of projection of corresponding lung lobes must be taken into account. Accordingly, auscultation information should be obtained about lobe areas. Auscultation must be started from above (pulmonary apex), then move to bases of lungs (diaphragm). Order of auscultation is summed up in Figure 11 *(4th vide– http://tamop.etk.pte.hu/apolastan/english.html)*

It is advisable to wait for a whole breath cycle (one in- and expiration) above each auscultation point .In case of pathological breath sounds you should observe if they can be heard on inspiration or expiration stronger, as well as their musical tone and intensity.

As lung, because of anatomical position, is reflected on pleura in the biggest area on the back, listen to at least 6 points on the back per haemothorax. Besides this, listen to the lung at some points on the anterior of thorax, as well. Hair of the patient can be disturbing, it can be reduced by making it wet.

Lung sounds

Sounds auscultated above the lung can be divided into two groups:

1. basic sounds when breathing (basic and tracheobronchial breathing)
2. adventitious sounds which indicate pathological case and appear as extra sound (bronchial, pleural, alveolar)

So called base breath/cellular breath/ vesicular breath sounds, from among the sounds divided into the first group, can be heard mostly above the (superior) lungs. In this case while breathing the air flowing into the alveoli vibrates their walls and produces the typical, deep sound. Typical of this sound is that it can be heard only on inspiration.

The other sound, which can be heard in normal conditions, is the so-called trachea-bronchial or tube sound in brief. This sound in normal healthy conditions can be heard only above the trachea and main bronchus, which is produced by the air – breathed in and out – flowing quickly in it.

The common reasons for weakening and suspension of cellular breathing:

According to its mechanism there can be two types:

1. Air is absorbed from alveoli (atelectasis) or alveoli are filled with discharge (pneumonia)
2. Alveoli are pressed externally, or pleural fluid or air collection do not conduct the existing cellular breathing (PTX,HTX). The two often interact making each other stronger.

Several sounds, generally indicating abnormalities, belong to the group of adventitious (accessory) murmurs. According to the place where it is generated, you can differentiate:

- pleural (sound produced by pleural laminas being rubbed)
- bronchial (from the narrowing of the bronchi, from the discharge dependent on its type in it, several different sounds can be created)

The typical characteristics of normal breath sounds and adventitious murmurs are included in the table below.

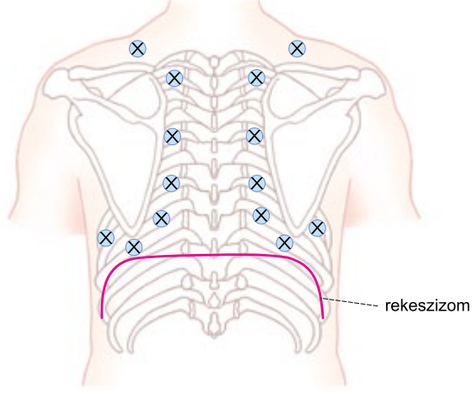

Figure 11 Comparative auscultation points of lung on the back

Examination of the abdomen

When examining the abdomen, two organ systems are concerned – the gastrointestinal and urinary systems.

All the important organs (liver, gallbladder, spleen and pancreas), related closely to the intestinal tract functionally are dealt with under gastrointestinal heading.

Establishing anamnesis in gastrointestinal heath problems

Most common complaints and the important questions connected with them, required for an accurate diagnosis, are enlisted below.

Abdominal pain

One of the most common complaints, it is worth to clarify:

- *location of pain* (e.g. right hypochondrium – pain in the area of gall)
- *direction of radiation* (e.g. liver and gall pains radiate to the right scapula, in case of pancreatitis pain occurs belt-like in the vicinity of navel)

Table 1 Classification of breath sounds

Normal sounds

Alveolar sound

Features:

- Created by airflow into the alveoli
- Can be heard only on inspiration

Trachea-bronchial sound (tube sound)

Features:

- Created by airflow in trachea and main bronchi.
- Can be heard through inspiration and expiration, (though it is stronger on expiration)
- Normally it is not transmitted to alveoli
- It can be heard best between the two scapulae, slightly on the right side of the spine

Abnormal sounds

Pleural sounds

Features:

- Can be heard on inspiration and expiration
- Can be heard better above lung base (its intensity is affected by breathing deviation)
- It sounds superficial, reminds of door creaking
- It can be heard above the affected pleura portion
- The intensity and character of murmur depends on fibrin and fluid content

Bronchial sounds

Features:

- Its character depends on the diameter of bronchus, the quality of mucus, air content of lung vicinity
- Sticky discharge (mucus) causes 'dry', more fluid ' moist' rale
- If lung is infiltrated around dry rale can be heard louder as if pneumatised tissue surrounded it
- Generally can be heard on inspiration

- *character of pain* (burning, caustic, stabbing, spastic)
- *duration of pain* (long lasting, durable pain in the gallbladder caused by stones)
- *relation of pain to having meals* (pain in duodenal ulcer relieves when having meals)
- *medication responsiveness of pain* (taking antacid relieves complaints in case of gastric ulcer)
- *other accompanying complaints* (vomit, diarrhoea, bloody stool)
- *potential correlation with defecation*

Appetite, lack of appetite, "repugnance " to food

Lack of appetite is important, although it is not a symptom informative enough of gastrointestinal disease in several cases. On the one hand, it can be a general symptom of upper respiratory infection, on the other hand you can encounter decreasing appetite symptom in elderly people without any special reasons.

Nausea, regurgitation, vomit

Like in the previous case, nausea and vomitting can be accompanying symptoms (mostly not a specific one) of several clinical diseases. Regurgitation (flowing back) means that the abdominal content flows back into the oesophagus, though it does not empty out (remains in the body). It is important to emphasize the increased risk of aspiration and airway obstruction in both cases (regurgitation, vomitting). It has to be taken into account importantly in case of patients who suffer from mental confusion.

In case of vomiting the content of vomit is worth being inspected because fresh or digested blood in it can be an important pathognomonic sign (symptom of disease).

Dysphagia (difficulty in swallowing), odynophagia (painful swallowing)

Dysphagia occurs mostly as a subjective complaint of the patient, without any detectable reason (narrowing) in several cases.

Painful swallowing can appear in oesophageal diseases and often in cases of upper airway, larynx, pharynx inflammations as well.

The gastrointestinal reasons of difficulty in swallowing and painful swallowing are similar: inflammation of oesophagus (oesophagitis), achalasia (spasm of the lower sphincter of oesophagus), oesophageal-/cervical tumour, other external pressure, diaphragmatic hernia, pains of the nervous system and muscular pains.

Heartburn (pyrosis), hiccup (singultus)

In case of pyrosis the patient experiences burning pain behind the sternum and /or in epigastric region (cardiac orifice), which can radiate to the throat. Symptoms, similar to pyrosis, can be caused by angina pectoris or heart muscle infarction (myocardial infarction), it is advisable to obtain information about cardiac- like complaints.

In the course of hiccup diaphragm contracts abruptly, spontaneously, which is accompanied by specific sound. Behind hiccups there may be thoracic and abdominal organs, irritation of respiratory system but the reasons are not always known.

Distention, increased gas forming

Gas content is accumulated in the bowels, which is experienced as a subjective complaint, a sensation of being distended (inflated) .Accumulated gases (mainly before significant narrowing) lead to tension of the smooth muscles of bowels, causing strong pain by this.

Components having an impact on gas formation and accumulation:

1. More gases are /are formed in the bowels because patients swallow more (like an infant) or after consuming certain food more gases are formed.
2. Blood supply of the intestinal tract deteriorates, as a result absorption of gases is slowed down (in the region of vena portae in case of congestion e.g. liver cirrhosis)
3. Emission of gastrointestinal gases is blocked mainly because of the deterioration of intestinal peristalsis.

Obstipation, diarrhoea, dyschezia, bloody stool, melaena

Deceleration of peristalsis in case of obstipation or constipation generally leads to defecation less often and change in stool consistency (dry, solid). In case of diarrhoea the patient empties more fluid stool than usual, which is accompanied by defecation increased in frequency and quantity. Other indicators of obstipation and diarrhoea can be found in other chapters.

Most common reasons of painful defecation are inflammation of anus, fissure of anus-region, inflammation of piles (haemorrhoids).

Melaena generally originates from a higher intestinal portion, it is black, creamy-like stool, which is partly digested and decomposed by bacteria. Bloody stool or melaena are highly suggestive of potential gastrointestinal tumours.

As far as other specialities of defecation are concerned, we refer to previous chapters.

Icterus (jaundice)

Jaundice can occur for several reasons. These can include the potential change in the systems, functions mentioned below:

- increased degradation of red blood cells, increased formation of bilirubin
- decreased bilirubin intake of the liver
- decreased capacity of liver to convert bilirubin
- blockage of the bile duct system in the liver or outside it, deceleration of excretion, discharge

In case of icterus, the colour and quality of urine and stool, the further inspection and examination of their components may play an important role in making a differential diagnosis.

Establishing anamnesis in case of diseases in urogenital sytem

Diseases of the urogenital system are dealt with by specialists of several fields.

Complaints experienced during health problems in kidney, ureter, urinary bladder are described in this chapter.

Abdominal, lumbar region pain, pain occurring during urinating

In case of diseases of the urogenital system, as in case of gastrointestinal diseases, it is advisable to distinguish:

- *distinctive features of pain* (strong, dull – inflammation of the renal pelvis (pyelitis), convulsive)
- *location* (e.g. renal region, lumbar region - kidney)
- *direction of radiation* (radiating along the ureter - stone)
- *duration of pain* (when urinating - inflammation of urinary bladder)
- *concomitant complaints* (vomit, nausea, blood in the urine)

Abnormalities in urination in frequency and urine quantity

Every patient must be interviewed about general complaints, including abnormalities of urination and urine.

To make an accurate assessment, it is necessary to know:

- how much liquid the patient has consumed (water, refreshments, soup etc. altogether)
- what other condition there is which leads to loss of liquid in his case
- what medication he/ she takes (especially diuretics)

After obtaining these details, it is advisable to assess abnormalities of urination and urine.

It must be emphasized that the increase in frequency of urination does not necessarily mean the urination of bigger quantity urine (polyuria).

It is suggested to ask the patient who has complaints of frequent urination how much liquid they take in on a single occasion.

Small quantity of urination (oliguria) or anuria – taking into consideration the above mentioned- may indicate the patient's severe condition, so the cause reasons must be found quickly.

Bloody urine (haematuria), abnormalities in urine colour and quality

Haematuria does not necessarily mean visible blood in urine (macroscopic haematuria), blood can often be detected only by laboratory tests (microscopic haematuria).As the presence of blood can rarely be considered normal in urine (e.g. during menstruation), the reason for it must be detected.

We refer to previous chapters for more on this matter.

Problems with voluntary control of urination

It comprises the whole spectrum from the inability to hold urine to urine retention. It is important to recognize the severity of problems with voluntary control and to determine the problems behind the disease .Such causes may be:

- diseases of the nervous system/ systemic diseases affected by the nervous system
- urogenital inflammation
- gynaecological diseases
- prostate diseases
- side effects of medication

As far as the other details are concerned, we refer to the previous chapter, as well as the knowledge obtained in your further studies.

Before the examination of the abdomen, you should remember the localization of abdominal organs and the position in accordance with each other. As several organs in the abdominal cavity overlap each other, in case of complaints it is more difficult to distinguish the affected organ.

It is useful to divide the abdomen into regions to make finding directions easier.

This division can be carried out in different ways. The simplest way is to divide the abdomen into 4 quadrants, by the help of the vertical line drawn in the median of the body and horizontal section placed on the navel (Fig.12/A).

According to another alternative, the abdomen is divided into 9 regions as displayed in the figure (12/B), the regions determined this way, can localize the potential abnormality more precisely.

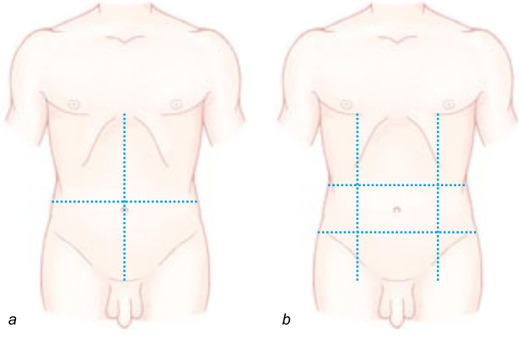

Figure 12 Picture A divides the abdomen into 4quadrants while Picture B shows the borders the abdomen divided into 9 regions

Inspection

In general, abdomen is inspected on the patient lying on his back.

You ask the patient to make his abdomen free so that the whole abdomen and inguinal region can be determined easily.

The following are to be observed on the abdomen:

1. How high the abdomen is located in comparison with the chest level (it is located higher in case of e.g. ascites, meteorism, bigger tumour)
2. What abnormalities can be found on the skin (e.g. caput medusae, scars of previous operations)
3. If the navel or other portions of the abdominal wall are protruding (because of hernia)
4. If there is a region which does not take part in abdominal breathing (circumscribed peritonitis)
5. If the abdomen is asymmetric.
6. If peristalsis can be observed on the abdomen (in case of thin individuals peristalsis can normally be seen).

It is easier to judge the more relaxed abdominal wall, the presence of potential hidden hernia in a standing position.

Sometimes it is necessary to observe the anus and genital organs besides the abdomen to evaluate the gastrointestinal as well as urogenital system thoroughly.

Auscultation

Auscultation provides several important details, mainly about the function of bowels. After inspection, examination must always be followed by auscultation. This must be done before palpation and percussion, as these treatments can change bowel sounds, so may provide false information for the examiner (small video) (*http://tamop.etk.pte.hu/apolastan/english.html).*

Initially, sounds accompanying bowel functions must be observed in case of a patient in a lying position. Binaural stethoscope must be placed on navel region and abdomen must be listened to for a long time. As sounds are conducted relatively well in the abdomen, it is sufficient to listen to some places in the 4 quadrants of the abdomen.

Bowel functions are sometimes slowed down, so it may be necessary to perform auscultation for several minutes in order to be able to recognize the presence/the type of peristalsis.

As well as bowels the bigger vessels located in the abdomen can be heard (abdominal aorta, renal femoral artery, artery iliac, artery (in inguinal fossa).

Auscultation points of arteries are indicated in Figure 13.

In case of a healthy individual healthy bowel function is indicated by bubbling sounds which accompany peristalsis.

When listening over abdominal vessels, normally they cannot be heard, as blood flow in vessels is laminar, which is soundless. In pathological cases in case of narrowing of a specific vascular portion (abdominal aorta, renal artery, common iliac artery) some "swishing" sounds can be heard.

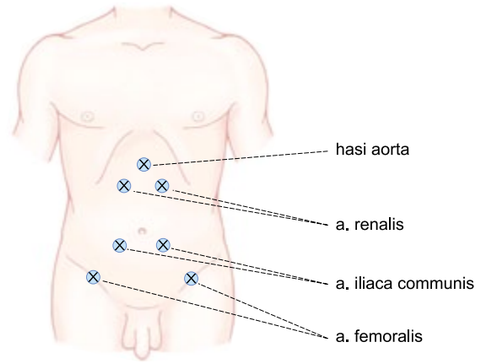

Figure 13 Auscultation points of abdominal veins

Palpation

As well as auscultation, palpation is the other important examining method of the abdomen.

Palpation has three main objectives in the course of abdominal examination:

- to assess muscular defence (defense musculaire) and compression sensitivity
- to assess other abdominal deviations (e.g. hernias)
- to look for pathological resistances

Before starting palpation, instruct the patient lying in the supine position to draw his legs flexed in knees, relax abdominal muscles, place arms at the sides.

If the patient identified pain localised on the abdomen when establishing anamnesis, then the identified area must be palpated last. So the patient's further, painful muscular defence can be avoided. The examiner can perform palpation of the abdomen either by one or by two hands. When palpating by both hands, hands can be held either next to each other or on each other. This is displayed in Figure 14.

In the course of examination take the position opposite the patient, standing on his right side. Palpate each quadrant of the abdomen, keeping your fingers in stretched position. Palpation should be started from the left lower quadrant of the abdomen, as the patient is less likely to have complaints here. (small video) (*http://tamop.etk.pte.hu/apolastan/english.html)*

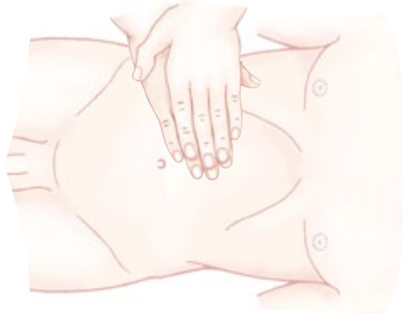

Figure 14 Two-handed abdominal palpation

Light and deep palpation can be distinguished in performance.

Performing *light palpation* the following information can be obtained:

1. assessment of muscular defence (rigidity or guarding)
2. detection of painful regions
3. palpation of the upper layers of abdomen (skin, lesions in tissues underlying the skin, hernias)

In the course of *deep palpation* you try to obtain information about the organs lying deeper, their deviations and abnormalities. In normal conditions the abdomen is tender, palpable, no pathogenic resistance and masses can be detected.

When palpating, it is important to know the borders of abdominal organs and their projection on the abdominal wall.

Pathogenic, reflexive, spontaneous consolidation of the abdominal muscle, so called "defense musculaire" is a sign of membrane inflammation.

It is important to distinguish if it is a diffuse or circumscribed symptom when a lump/ compression sensitivity is experienced. Diffuse process refers to peritoneopathy, while the causes of circumscribed deviations can be different dependent on the abdominal regions.

- *Right upper quadrant:* gallstone, inflammation of gallbladder, liver diseases
- *Epigastrium (cardia region):* left lobe of liver (norm), pancreatic pseudocyst, gastric ulcer/tumour, oesophagus irritation, transverse colon tumour
- *Left upper quadrant* : enlargement of spleen/spleen disease, pancreatic cyst, inflammation/tumour of the specific portion of large intestine
- *Right lower quadrant:* Crohn's disease, appendicitis, disease of specific portion of large intestine, disease of the ovaries/fallopian tubes
- *Navel region:* hernia, aorta aneurism, peritonitis
- *Region above pubic:* uterus, diseases of bladder
- *Left lower quadrant:* colonic diverticulum, sigmoid and colon descendent disease, disease of the ovaries/fallopian tubes

Palpation of the liver

It is recommended to perform the palpation of the liver after the complete, light and deep palpation of the abdomen, as if the liver is enlarged, exceeds its normal size (it may exceed the right costal arch border by several centimetres), then the following is not expected to be carried out.

If the border of the liver could not be palpated, then examination is the following:

While standing opposite the patient in supine position (lying on the back), place both your hands under the right costal arch then move them to the border of the costal arch, press them under the costal arch and try to reach the border of the liver. The border, the edge, the anterior surface of the liver can be determined more precisely if the patient is instructed to take a deep breath when the liver moves down, so it can be reached more easily. On inspiration, the liver moving down falls over under your finger, while its edge can be felt.

The size of the liver must be measured on inspiration (how far it exceeds the costal arch in transverse fingers or centimetres) (small video – *http://tamop.etk.pte.hu/apolastan/english.html)*

When examining the liver, information must be obtained about the following:

Size of the liver, palpation, sensitivity, border, surface

Enlarged liver with uneven surface (with nodules) may refer to cirrhosis, while enlarged liver with flat surface may refer to fatty degeneration (steatosis). In case of liver enlargement, symptoms of increased pressure must be looked for within the system of portal vein, like caput medusae, pathogenic fluid effusion -accumulation (ascites).

Palpation of spleen

Normal size spleen can be palpated only in a special case (in very deep diaphragmatic position). Its examination is similar to that of the liver; only you try to reach under the left costal arch. If the patient takes a deep breath, it does not help to reach the spleen, so this manoeuvre is not applied frequently.

However, the spleen can be reached more easily if the patient is examined turning on his right side.

Behind spleen enlargement several infectious-, or haematopoietic, lymphatic diseases can be supposed.

Palpation of the kidneys

Kidneys can be palpated only in thin individuals. Palpation of kidneys is a difficult job and requires experience, so its application does not provide new information for the diagnosis in many cases.

During the examination you place one of your hands in the lumbocostal angle of the patient lying in supine position, while your other hand palpates from upwards (in accordance with the position of kidneys).You try to lift the kidneys by ballottements –slight pushes- with your lower hand, making them palpable between your two hands by doing so.

As kidneys generally cannot be palpated (with the exception of thin patients), so if they become palpable, it may refer to enlarged kidneys, the presence of kidney cyst.

Palpation of the abdomen can be completed by rectal digital examination as well as by examination of external reproductive, genital organs, concerning their characteristics reference should be made to your further studies.

Percussion of the abdomen

Percussion of the abdomen, as a physical examining method from among the others has more restricted importance. The region of the abdomen cavity, not covered by costal arches is mostly made up of bowels, which produces normal tympanic sounds when percussing. In normal conditions the size of parenchymal /compact organs (liver, spleen) as well as organs filled with fluid (urinary bladder) can be estimated simply, as their percussion sound is dull unlike the other regions of the abdomen. (*http://tamop.etk.pte.hu/apolastan/english.html)*

Percussion of the abdomen is also performed on the patient in supine position.

Examination of organs – compact/filled with fluid is performed in the specific region, while "general" percussion of the abdomen begins from the highest point of the abdomen (usually from the navel region) and continues radially, in all directions, completely percussing the abdomen. During percussion you listen to the change of the tympanic sound into dull.

Percussion of the liver

Liver is covered by the right costal arch, so it can be percussed only in the right upper quadrant in accordance with costal spaces (as in the case of thorax). In general, the lower border of liver is determined in the right midclavicular line moving downwards from the diaphragm. If liver is enlarged, it can be recognised in its dull type of percussion under the right costal arch, as well.

Absence of hepatic dullness- in case of internal disease - refers to free abdominal air, generally gastric-intestinal perforation.

Percussion of the spleen

Spleen is a relatively thin organ, covered by the left costal arch, so it is recommended to percuss it slightly, with less force. Before spleen percussion, make the patient lie on the right side and ask him to lift his left arm and place it next to his head. So the left side of the patient becomes free for examination.

In the well-known way, in the axillary line moving from above (diaphragm) to down in the costal spaces and in normal case you expect dull sound -identifying spleen-to appear between the 9th and 11th costal spaces.

The assessment of liver, spleen and other lump (abdominal sensitivity) can be more difficult with gas-filled bowels.

Percussion of the urine bladder and the uterus

Percussion of the urine bladder and the uterus is justified in case of hypogastric, urinal complaints. During examination you move from the pubic bone down the medial line.

The size of dullness reveals the size of the urine bladder or uterus depending on the repletion of the bladder/ the size of uterus.

Organs of locomotion

Examination of locomotor organs

Examination of locomotor organs generally does not include their detailed examination. Concerning organs of locomotion rough deviations in shape and functional deviations must be mentioned. Functional assessment of organs of locomotion must be performed in accordance with the function and examination of the nervous system.

The following things must be done in case of complaints presumably of locomotor origin:

- Ask about previous trauma, or orthopaedic, neurological, vascular diseases
- Inspection of the identified limb
- Palpation of the identified limb (feeling for symptoms of temperature, swelling, oedema, inflammation, deep vein thrombosis etc.
- Palpation of peripheral pulses on the identified limb (on several places)
- Examination of mobility spectrum of the movements (active and passive) of the identified limb
- Examination of major types of senses of the identified limb

If any suspicion arises, detailed examination of the non-identified parts of body can be performed, as well.

If there are any symptoms of nervous system origin, the examination can be completed by neurological examination which is not included in this textbook.

*

Negative internal status

1. Moderately developed, adequately nourished
2. No oedema, cyanosis, icterus
3. Mouth and pharynx formation
   - dentition: complete/not complete/partial denture/replaced/removable
   - tongue: coated, free from fur/clean
   - Pharynx free from inflammation
4. Lymph nodes, thyroid
   - lymphadenomegaly=lymphadenopathy cannot be palpated in either region
   - submandibular
   - cervical
   - axillary
   - inguinal
   - glandular palpation, thyroid free from nodules
5. Chest, lungs
   - proportionate thorax frame
   - excursion of diaphragms is appropriate, symmetric (right dome of the diaphragm is slightly higher)
   - complete, resonant, not tympanic lung percussion sound
   - breathing is coarse, no congestion, crepitation on either side
   - eupnoea
6. Cardiovascular status
   - pulse, blood pressure
   - relative heart dullness is normal
   - rhythmic heart beat, clean heart sounds, no murmur
   - no murmur above carotis, femoral
   - radial artery, dorsalis pedis artery, a tibial posterior can be palpated
   - external jugular vein is not filled
   - no varicosity
7. abdomen, lumbar region, anal region
   - inspection: ascites, anal region
   - abdomen is tender and able to be palpated, no pathogenic resistance, no compression sensitivity
   - intestinal sounds can be heard clearly
   - Rectal digital examination
8. Are there any deviations of locomotor organs?
   - no obvious functional deviations, no deviations in shape

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In describingno and documenting a murmur, you should be able to characterize 4 properties of an "abnormal" heart sound:

[1] The location of the heart sound on the chest (i.e. where is it heard loudest and where you can hear the sound at all).

[2] The timing of the heart sound (i.e. early diastolic, pan systolic, etc.)

[3] The grade or intensity of the heart sound (i.e.1-6 (see table below))

[4] The quality and shape of the heart sound (i.e. musical crescendo, harsh snap, etc.)

Where to place your stethoscope

As with palpation of the heart, auscultation should proceed in a logical manner over 4 general areas on the anterior chest, beginning with the patient in the supine position. The 4 percordial areas are examined with *diaphragm,* including:

[1] Aortic region (between the 2nd and 3rd intercostal spaces at the right sternal border) (RUSB – right upper sternal border).

[2] Pulmonic region (between the 2nd and 3rd intercostal spaces at the left sternal border) (LUSB – left upper sternal border).

[3] Tricuspid region (between the 3rd, 4th, 5th, and 6th intercostal spaces at the left sternal border) (LLSB – left lower sternal border).

[4] Mitral region (near the apex of the heard between the 5th and 6th intercostal spaces in the mid-clavicular line) (apex of the heart).

After this initial examination in the supine positions, several additional maneuvers should be accomplished in the thorough cardiac exam, as follows:

[1] Instruct the patient to turn onto their left side (left decubitus position) and listen with the *bell* of the stethoscope at the apex for mitral stenosis (low pitched diastolic murmur).

[2] Instruct the patient to sit upright and re-examine the 4 percordial regions, again with the *diaphragm* of the stethoscope.

[3] Instruct the patient to lean forward, exhale, and hold their breath. Listen with the *diaphragm* between the second and third intercostal spaces at the right sternal (aortic) and left sternal (pulmonic) areas for aortic regurgitation.

14. Vital Parameters

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Temperature

Physiological background

In the course of the energy distribution of the body, heat is released as a byproduct, which is mostly produced as a result of the formation of macroerg chemical phosphate bonds and their decomposition. The heat released in this process does not damage the organism because its high water content absorbs and evenly distributes it throughout the whole body , it is also released gradually.

Normal body temperature varies for each individual, the general climate and external environment also plays a determining role in terms of surface temperature. Surface temperature represents the temperature of the skin and the subcutaneous tissues. The temperature measured in the inner organs is called core temperature. However an unambiguous core temperature cannot be determined, and various normal values are given in the scientific literature as well, since this temperature is not even permanent in the given inner organs. Nevertheless, it can be stated that in case of the organs of the thoracic, abdominal, central nervous system and osseous-muscular organ systems, it is relatively permanent. In the literature (ref), normal core temperature (normothermia, euthermia) is given as 36-37.5°C (whereas according to some literature (ref) it is 37-37.8 °C). The value of core temperature is characterized by the balance of heat production and heat loss.

Body temperature is determined by three factors: the amount of produced heat, the temperature of the environment and the heat regulation of the body.

The factors influencing body temperature are:

- Hormonal factors
- Meals
- Sense of hunger
- External environmental temperature
- Age
- Physical activity
- Sweating
- Time of the day fluctuation
- Stress
- Environment
- The consumption of hot / cold food or drink
- Smoking

The activity of our body is continuously changing; consequently the amount of the produced heat is changing continually as well. Heat production is determined by the following factors: voluntary muscle movements, involuntary muscle movements such as shivering, intermittent metabolic increase without muscle work and biological rhythms. These processes are significantly influenced by certain hormones, such as thyroxine produced by the thyroid gland and catecholamines produced by the adrenal medulla. Out of the biological rhythms, the rhytm of sleep and wakefulness causes an almost 1° C temperature difference between the highest and lowest values of body temperature. Body temperature is the highest in the late afternoon and early evening hours, while it is the lowest during sleep and in the early morning hours. The ovarian cycle of women causes a 0.5°C increase in body temperature as a result of the progesterone production of the forming corpus luteum after ovulation. In women the change of the oestrogen level may result in the development of "hot flushes" leading up to and during the menopause.

The environment affects body temperature with the following factors: air temperature, humidity, radiant heat and heat flow. The human body is protected from the environmental impact by insulation, but it protects only within narrow limits, that is why defenses implemented by human behaviour and adaptation to the environment is important.

The centre for thermoregulation is located in the hypothalamus, which ensures a constant body temperature of the body. The hypothalamus adjusts the set point, which is the body temperature, this does not activate either the heat producing or the heat releasing mechanisms. Due to the hypothalamus maintaining body temperature on the set point value, it is often compared to a thermostat. The hypothalamus activates the heat production and heat releasing mechanisms and behaviour through efferent pathways. The beforementioned efferent pathways are connected to the striated muscles, the autonomic nervous system and the endocrine system.

The body temperature raising effects of the hypothalamus are the following: increased striated muscle activity, shivering, increased sympathetic efferent activity, vasoconstriction in the vessels of the skin, increased adrenaline production in the adrenal medulla, resulting in an increased metabolism in the body, the increased thireotrop hormone, i.e. TSH secretion of the adeno-hypophysis. The body temperature decreasing effects of the hypothalamus are as follows: reduced striated muscle activity, decreased sympathetic efferent activity, decreased production of TSH. However, these processes alone are not sufficient to reduce body temperature, that is why the heat releasing mechanisms also become activated. During heat release, heat firstly gets to the skin's surface from the inside of the body and then from there to the environment, so it is a two-step process.

Inside, body heat release occurs through the bloodstream and heat conductivity of wet organs and tissues. The heat that got to the skin surface may escape by several mechanisms, namely in the form of conduction, flow (convection), radiation, and evaporation.

Hypothermia

Lower than normal temperature, hypothermia, core temperature below 35°C

Practically the most common reason for hypothermia is cooling down due to the decrease in external temperature which mainly occurs to homeless people or patients having been saved from water. Alcohol consumption is also a predisposing factor and it is even more dangerous in case of hypoglycaemia and the joint consumption of antidepressants and alcohol. Artificial hypothermia can be useful as long as the core temperature is decreased to 32°C for example in case of cardiac surgery or other major surgery, since the basic metabolism and the demand for oxygen are also decreased if the body temperature is low. If temperature falls below 32°C, complications can be expected, such as arrhythmia, coagulopathy, cardiovascular instability, hyperglycaemia, electrolyte disturbances.

The depth levels of hypothermia

Several versions of hypothermia classifications are known in scientific literature where not only the categories of hypothermia but temperature figures belonging to each category and the physiological changes related to them are also defined within a relatively wide range. From the aspect of hospital care hypothermia can be classified into three major stages which are:

- mild: 33°C –35°C
- moderate: 28°C –32°C
- severe: <28°C

Within these, severe hypothermia can be categorized further in terms of the development of symptoms, which is discussed in details below, in the chart regarding specific temperature figures:

Low temperature and its treatment

Depending on the degree of hypothermia, different heating methods are used. We distinguish passive and active heating techniques.

Increasing the temperature of the outer environment, covering the patient (wool is the best to be used), applying preheated blankets and sheets belong to the passive methods. It is very important that these methods are applied on the whole body, especially the head should be covered, this way we can decrease heat loss by 30%.

Active external heating is needed when the core temperature is between 34–36°C. The application of liquid or air circulating heating blankets, heated blankets, heated infusion (heated to about 40°C) belong to the active methods. If the core temperature goes below 30°C, applying further active methods according to the following techniques may become justified: making the patient inhale heated oxygen, mediastinal or peritoneal lavage with fluid, the lavage of the urinary bladder and the stomach with heated solutions, warm water enema, heating through extracorporal circulation, haemodialysis (Docherty, Foudy 2006).

Higher than normal body temperature, hyperthermia

The hypothalamus, as the thermoregulatory centre of the organism, is responsible for keeping body temperature at a default set point. In case of hyperthermia the core temperature rises over the set point of the hypothalamus which is 37.2°C in the morning and 37.7°C in the afternoon. An ordinary feverish status must not be mistaken for a real hyperthermic state, since the latter is more likely to be caused by staying in a hot environment for a longer period of time, the higher temperature is not regulated by the hypothalamus and its pathomechanism is also different.

Table 1 The symptoms of hypothermia (van Beek 2009)

Body temperature	Symptoms
36 °C	Normal body temperature
35 °C	Peripheral vasoconstriction, shivering, speech disturbances, hyperreflexia
34 °C	The patient is still conscious, burdensome movements, E.C.G. abnormalities may occur: The J wave (Osborne wave) can be found at the meeting point of the QRS complex and ST-segment, the amplitude and duration of which is gradually increasing with the decrease in temperature.
33–31 °C	Retrograde amnesia, shivering ceases, hypotension, dilated pupils
30–28 °C	Unconsciousness, muscle rigidity, bradypnoea, bradycardia which increases the J-wave amplitude further on.
27–25 °C	No reflexes can be induced, ventricular fibrillation
17 °C	Isoelectric E. C.G.

The degrees of hyperthermis are

- Mild: heat fatigue, heat syncope, heat exhaustion, sunstroke
- Severe: heat stroke

If the body cannot give off the produced superfluous amount of heat (e.g. in case of persons subjected to high environmental temperature), heat stagnation occurs. Hyperthermia can develop as a result of heat gain originating from increased metabolic activity, due to decreased exothermic processes and external heat gain as well. Heat prostration is its rapidly developing form, when the body temperature is over 40°C, the patient is of disturbed consciousness, their pulse will be strong and fast, delirium and coma may also evolve. Before the development of heat prostration, heat fatigue evolves the characteristics of which are a sense of weakness, cool and wet skin, and a weak pulse. It progresses with skin syncope (dizziness, paleness, perspiring wet cool skin and rapid weak pulse), then heat spasms (the muscular cramps of the limbs, abdominal cramps) and heat exhaustion develop (dizziness, sense of weakness, nausea, coordinational disturbances, sweating, cold damp skin).

We speak of a sunstroke when the uncovered skin or head is subjected to sun radiation and body temperature raises due to heat absorption.

Appropriate fluid intake and the protection of the head from direct sunshine play an important role in prevention.

The treatment for hyperthermia

Immediate heat withdrawal is necessary or cooling, the treatment of hypotonia and fluid substitution. In case of groups subjected to risks, prevention is important i.e. protection from direct sunlight (using beach umbrellas or caps), applying ventilators or air-conditioners, forced fluid intake and in case of hot weather or heatwaves an increased abstention from physical activity.

The degrees of fever are:

- Subfebrility (subfebrilitas): 37,5°C –38 °C
- Febrility (febris): 38°C –39 °C
- Pyrexia: 39°C – 40 °C
- Hyperpyrexia: > 40 °C

The types of fever are

Continuous fever types are:

Febricula is a mild type of 'ordinary' fever which lasts for a short period of time. It does not bear exactly defined reasons or typical pathological attributes that it is accompanied by.

Febris continua (permanent fever): the body temperature is higher than normal but the daily fluctuation does not exceed 1°C. We can come across this type of fever also in case of abdominal typhus or pneumonia.

Febris intermittens (jumping fever): febrile and afebrile periods take turns within a few hours, two daily peaks of fever can be observed, the fluctuation of the body temperature is larger than 1°C. This type of fever process occurs for example in case of kala-azar and other tropical illnesses.

Febris remittens (remittent fever): the body temperature is over normal all day long, there is no afebrile period, the fluctuation of the body temperature exceeds 1°C. It may occur for example in case of infective endocarditis, sepsis, tuberculosis.

Recurring fever types are:

Ague – malaria: according to periodicity an ague appearing every other, third or fourth day can be distinguished.

Februs undularis (undulant fever): febrile and afebrile periods take turns within several days (more than 2 days), each of which is sustained for longer than 24 hours. The basic disease is often brucellosis.

Pel-Ebstein's fever process: it develops related to Hodgkin's lymphoma, the patient has a very high fever for a week, and then there is no fever for a week and so on.

Febris relapsing (relapsing fever): a common causative agent is Borellia. This type of fever is characterized by the feverish status continuing to exist for several days which is followed by feverlessness for several days. Along with the drop of fever, hypotonia and shock may also develop. The newer relapses are generally milder in their process.

Neutropenic fever: is an immune system damage, this type of fever develops mainly in connection with chemotherapy, it requires emergency care.

Septic fever process: it is accompanied by remittent + intermittent phenomena.

Postoperative fever: the development of inflammatory responses is a natural process after surgeries. A postoperative fever can be caused by this inflammatory reaction and the psychological stress that goes with it. In addition to these, the forms of anesthesia also affect postoperative fever, although other than anesthetics, the patient may also receive additional pharmaceutical products (opioids, NSAIDs), which also influence fever by their immune modulating effects. Other important factors are: the duration of surgery, the patient's age, the surgical site and whether the patient had some form of infection in his body before surgery (Negishi, Lenhardt 2003).

The causes of fever can be

- bacterial infection
- viral infection
- parasitic infections
- fever of unknown origin
- malignant hyperthemia.

Fever refers to organic illnesses if the fever exceeds 39°C, besides the rapid and well detectable worsening of the general status, the patient's body weight decreases and his becoming anaemic is verified (Juhász).

Anxiety and nervous exhaustion may also commonly stand in the background of a long-lasting febrile status. In order to exclude this option the Raven (amidazophen sedative)

test can be applied, upon the implementation of which the patient's fever ceases when a sedative is given.

Fever of Unknown Origin – FUO:

We speak about a fever of unknown origin if the body temperature is over 38.3°C for at least three weeks and the root cause is not detected even after a week-long hospitalized medical check-up. In cases like this there can be an infection (40%), a malignant process (30%) or a collagenic-vascular disease (20%) in the background. In the remaining 10% the cause does not get to be identified (Juhász).

Certain pharmaceutical products or their side-effects often stand in the background of fevers of unknown origin by the development of allergic or hypersensitive reactions but they can also influence thermogenic processes.

Other symptoms of fever are:

- Shivers
- Red cheeks
- Dry, warm skin
- Feeling out of sort, pain in the limbs
- Lack of appetite
- Headache
- Delirium, feverish spasms in case of children

Reduction of fever

The necessity of fever reduction has not been unambiguously verified until today. In terms of this question there is no unified standpoint within the profession either. Since a febrile status is the body's reaction to some pathogenic effect, it is not always useful to reduce it. Before antibiotic therapies were introduced, malaria infections had been induced, or killed typhoid bacteria had been injected into the patient to cause "positive" fever for the cure of several diseases (e.g. syphilis).

Fever reduction is indicated in case of the following medical conditions:

- severe heart disease, respiratory deficiency
- cerebral vascular occurrences
- in case of newborn babies with serious hypoxia
- rapid heart functions
- increased loss of fluid
- increased metabolism caused by fever
- shortness of breath
- in case of patients with severe epilepsy.

The body temperature being raised by 1°C increases the heart frequency by 10/minute. The rise of the body temperature also influences the respiratory count, however no unified standpoint can be found about its degree in the scientific literature and especially in case of children the increase of the respiratory count shows a higher rate of dispersion. In case of adults this figure is 5-6/minute (El-Radhi, Davies, Gadomski).

Caring for a febrile patient

With a febrile patient it is a basic consideration to increase the patient's comfort which can also be facilitated by different forms of cooling. During the process of fever reduction, nurses have to pay extra attention to minimizing complications and ensuring a feeling of comfort for the patient. The continuous monitoring of the temperature chart and also its cross-checking with the patient's clinical status are indispensable for being able to choose the appropriate form of fever reduction, may it be physical or medicine based..

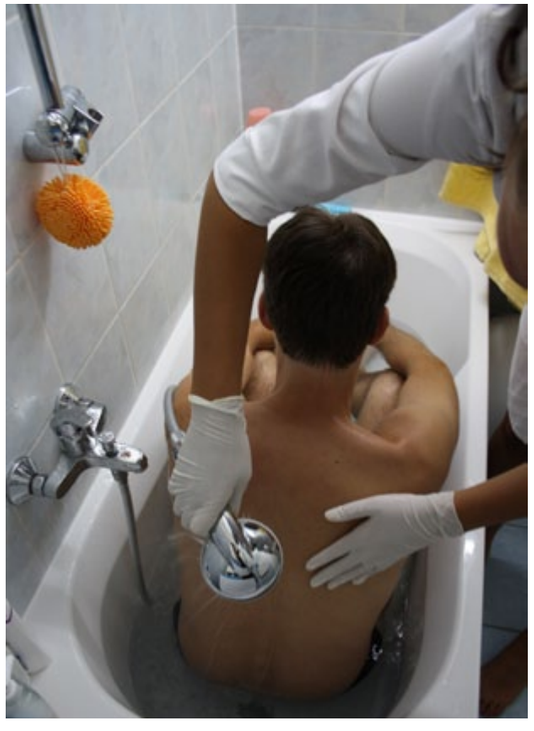
In order to prevent complications it is best to watch the vital parameters i.e. the patient's pulse, respiratory count, state of consciousness, state of skin, temperature, the degree of perspiration, shivers, sweating and any such factor that can indicate an increase in metabolic activities. Taking a haemoculture specimen has to be done before there is a jump in fever, during shivers (haemoculture is discussed in more details in the chapter about body discharge).

Physical fever reduction

Sponge-down with lukewarm water: its routine application is controversial. It is true that it temporarily decreases body temperature but it causes shivers and trembling which exhaust the metabolic reserves and later it also raises the core temperature.

Cooling bath:

We assure body temperature bath water for the patient which is gradually cooled down to 31- 29°C. It is more endurable for patients if they do not lie in the bath water up to the neck but only to the bottom part of the trunk and the rest of the body is sprinkled with the bath water.



Picture 1. Implementing a cooling bath

Water compress:

It can be full-body or partial but these procedures should last only till the body temperature goes down to 38°C. During this process lukewarm water has to be run in a wash-bowl (100 mls of menthol alcohol may be added to the water) and we let it cool down to room temperature. In case of a partial compress we put a piece of wet cloth onto the forehead, the curves of groin, the lower arms and the chest whereas in case of a full-body compress we place wet cloths onto the forehead, the curves of the groin, chest and also onto the upper and lower limbs. The wet compress has to be changed frequently, as soon as the cloth warms up.

Temperature Measurement

The areas for measuring temperature, invasive and non-invasive methods

Core temperature vs. surface temperature

In case of feverish patients a real core temperature can be measured by the central venous cannula or Swan-Ganz's catheter. Other than these the figures measured by an tympanic thermometer, or in the nasopharynx and oesophagus can be considered core temperature, whereas in case of just normal body temperature, rectal temperature is also reckoned core temperature but in case of a febrile disease it cannot be considered core temperature any longer. The temperature measured orally is close to the core temperature (van Beek, 2009).

- Tympanic
- Rectal
- Nasopharyngeal
- Pulmonary artery
- Temporal artery
- Axillary
- Oral

Picture 2. Measuring temperature with a digital thermometer.

- Oesophagus
- Gallbladder

The temperature in the different body openings (rectal, vaginal) is higher than the one measured orally, which on the other hand, is higher than the temperature of the skin i.e. skin <oral<rectal, vaginal.

The types of thermometers

After having made the diagnosis, the exact determination and follow-up of the patient's temperature is a fundamental consideration that can be done in several different ways with various types of devices.

Glass mercurial thermometres

Based on Joint Decree 41/2000 (December 20) of the Ministry of Health Care and the Ministry of Public Health and Joint Decree 41/2008 (October 30) of the Ministry of Health Care and the Ministry of Environmental Protection and Water Conservancy mercury is not permitted to be put into circulation in thermometers or in any other measuring device like for example in blood presure measuring gauges which are intended to be distributed for population sales. As a result of this, mercurial thermometrers are less and less in use nowadays due to the potential toxic effect of mercury. A significant role is ascribed to this type of temperature measuring method also in the spread of infections in hospitals.

Non mercurial glass thermometres

These types of thermometers contain gallium instead of mercury. Their measuring time is between 2 to 3 minutes depending on the place of measurement, it takes 2 minutes in case of oral or rectal measurement and 3 minutes upon axillary measurement. Their measuring range is between 35°C and 42°C. In case of glass thermometers a special attention has to be paid to their fragility especially when oral or rectal temperature is taken and also with groups of patients where their application is unsafe, for example with children or patients with psychological problems.

Liquid crystals

The application of liquid crystals that constitute a transition between substances of liquid and solid state of matter is characteristic of the operational mode of this device. This method can practically be implemented by a thin plastic band. Disposable adhesive plasters, skin thermometers, for example, are function based on this principle.

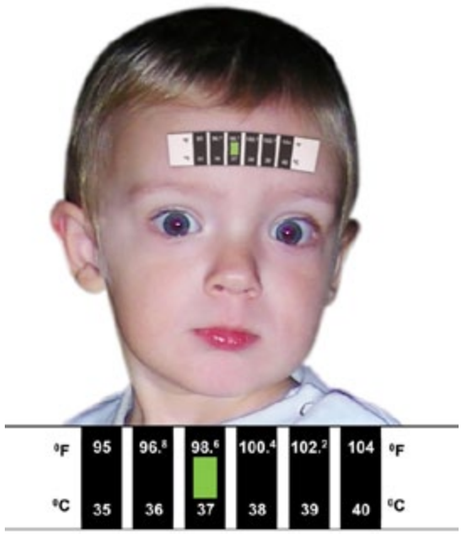
Tympanic thermometer

It gives a relatively reliable measurement result. The basis

Picture 3. Non mercurial glass thermometre

of its functioning is that it derives a figure from the temperature of the external auditory passage and the eardrum. The detection happens via infrared radiation and sensors (IRED – infrared radiation ear device).

Axillary temperature measurement with a digital thermometre (Table 2)



Picture 4. Disposable liquid crystal skin thermometre

Picture 5. The application of an eardrum thermometre

Table 2. Axillary temperature measurement with a digital thermometre

	Intervention	Explanation
1.	Perform hygienic disinfection.	Due to keeping the rules of sepsis-antisepsis.
2.	Identify the patient and inform them about the necessity and process of the intervention.	This may decrease the patient's fear and increase their willingness to cooperate.
3.	Prepare the necessary devices and the room for carrying out the intervention.	
4.	Perform hygienic hand disinfection and put rubber gloves on.	Keeping the rules of sepsis-antisepsis, and in order to protect the staff.
5.	Position the patient, ensure a supine position, loosen his upper clothing.	If it is necesseary dry the armpit
6.	Turn on the thermometer. The digital display showing a „0.00" value and a flashing „° C" signal indicates when the device is ready for operation.	
7.	Place the thermometer in the axilla, then ask the patient to keep the device in the given position. This can be achieved by the patient crossing their arms on their chest and holding them this way. In case they are unable to do this, help the patient hold their arms.	The measurement is determined by the incorrect position of the thermometer or the patient keeping their arms inappropriately, so the nurse must pay attention to these factors.
8.	A sound signal indicates when to remove the thermometer.	
9.	Read the obtained value and document it (on the temperature graphic chart and in the nursing documentation).	Documentational obligations must be met. In case of a febrile status, the value must be indicated to the doctor regarding further therapies.
10.	Arrange the patient to be comfortable.	
11.	Tidy up the environment and the devices (clean the thermometer).	Cleaning the thermometer according to the instructions of the manufacturer.
12.	Perform hygienic disinfection of the hands again.	In order to prevent cross-infections.

The devices necessary for the intervention are:
- thermometer
- documentation
- non sterile ruber gloves

Pulse

The pressure and volume change occurring at a given point of the arteries is called a pulse. The thrust wave running through the arterial section is called a pulse wave, the speed of which depends on the tension and flexibility of the vessel walls. We speak of a venous pulse when the pressure changes occurring in the heart, have a counter-effect on the large veins near the heart and there they lead to changes in pressure and volume. Further anatomical and physiological bases regarding the functioning of the heart can be found in the chapter on E.C.G.

The examination of the pulse is an objective, easily applicable examinational method that can have an important diagnostic significance in the assessment of the cardiovascular status.

Checking the pulse can be done:

By palpation

This is the classical pulse examination method, however the examination itself depends also on the practical experience of the staff, mostly determining the peripheral pulse and its quality attributes and discerning the state of the peripheral vessels as well. Its advantage is that it can be constituted as part of a simple, fast routine examination. It being a relatively subjective method due to the palpation of the artery and pulse-control being non-continual are its disadvantages.

By instrumental examination

Determining the pulse with the help of a stethoscope by auscultation and also with tolemetry equipment and a monitor, or with a pulsoximeter, a Holter monitor or an ABPM belong to the non-invasive methods. The primary function of the latter is not directly registering the pulse rate but during its application the examiner has an opportunity to determine it.

The determination of the pulse rate with the help of an arterial pressure graph with invasive arterial pressure measurement and also the measurement of the pulse speed (PWV) belong to the invasive methods.

Table 3. Physiological frequency / pulse rate at different ages (Timby)

Age	Pulse rate / minute
Newborn	120–160
1–12 months	80–140
1–2 year/s	80–130
3–6 years	75–120
7–12 years	75–110
13 year–adult	60–100

The pulse can be palpated upon any artery near the body surface that can be pressed to a bony base. The heart frequency can be stated also by auscultation that has to be done over the apex of the heart but in fact, this is not the classical pulse examination method.

Factors influencing the pulse rate are:
- Physical activity
- Age
- Gender
- Hormonal effects
- Temperature
- Emotional effects
- Medication
- Bleeding, loss of fluid
- Change in body position
- Pulmonary factors
- Cardiac factors
- Stress
- Stimulants e.g. smoking, caffeine

When to measure a pulse?
- On the occasion of each patient's admission
- Before, during and after transfusion
- Before, during and after surgery
- In case of cardiac problems
- In case of patients in a critical state
- In case of infection
- In case of noticing any change in the patient's status, even if discerned subjectively

Tachycardia

We speak of tachycardia in case an adult client's pulse is over 100/minute

Its reasons can be:
- Hypovolaemia, related to a temporary compensational mechanism
- Raised body temperature
- Stress
- Heart disease, cardiac insufficiency, inflammation of the heart muscle
- Infection
- Short physical activity
- The acute phase of pain
- Anxiety, excitement
- Positive chronotropic medication (e.g. atropin)
- Bleeding (the sympathetic activity increases as a compensational mechanism)
- Change of body position (standing, sitting)
- Pulmonary factors (part of a compensational mechanism as a result of bad oxygenization)
- Hyperthyroidism

It is important to treat a tachycardic status because tachycardia puts an intensified strain on heart functioning. The

tachycardia that does not assure the stroke volume and consequently the cardiac minute output either may also lead to the collapse of circulation.

Bradycardia

We speak of bradycardia in case an adult client's pulse is less than 60/minute.

Although if the frequency is below 50/minute and physiologically during sleep it can also be around 40/minute, it has more of a pathognomonic nature.

It can be caused by:

- The parasympathetic nervous system being activated
- Cardiac insufficiency
- Medication
- The diseases of the conduction system of the heart
- Durable physical exertion, athletes pursuing some sport competitively
- Hypothermia
- Lying positon
- Durable intensive pain (parasympathetic activity)
- Relaxation
- Negative chronotropic medication (e.g. digitalis)
- Poisons
- Increasing cerebral pressure
- Hypoxia

Assessing the quality of pulse

Rhythm

The rhythm of the pulse can be regular or irregular. Within the irregular pulse, regular and irregular subtypes can also be differentiated. An erratically irregular pulse can be palpated for example in case of extrasystole when the normal rhythm is interrupted by an extra ventricular contraction. This phenomenon does not necessarily indicate a severe disease, it can occur for instance with young people e.g. upon physical exertion, stress and we can also come across it in case of minor valvular insufficiencies. Nevertheless, the weaker the heart muscles are where extrasystole occurs, the larger its significance is and the danger increases that this process turns into a malignant rhythm disorder. Other than these the viral infections of the heart muscles, ischaemic heart diseases, acute myocardial infarction, angina pectoris and the lack of kalium and magnesium are also predispositioning factors.

We speak of regularly irregular extrasystole in case of bigeminy, trigeminy, quadrigeminy and related extrasystole. If two heart beats of different origins follow one another in a 1: 1 rate i.e. every heart beat starting from a sinus node is followed by an extrasystole of a ventricular origin, it is called bigeminy. If an extrasystole appears after a heart beat originating from two sinus nodes, it is trigeminy and if a heart beat originating from every third sinus node is followed by an extrasystole, we speak of quadrigeminy. We speak about related extrasystole if the extra heart beats of ventricular origin occur in couplets or triplets.

Respiratory arrhythmia or sinus arrhythmia also constitutes an erratically irregular rhythm which is a physiological phenomenon and it is very common in case of children and young people. It comes from the thoracic pressure conditions changing parallell with breathing. However, in case of older individuals further examinations are worth exploring because it can appear as a symptom of different heart diseases.

Arrhythmia absoluta (arrhythmia perpetua) is also an erratically irregular rhythm which can be experienced in case of atrial fibrillation or atrial flutter. In this case a deficit shows up during the simultaneous examination of the rhythm assessed by auscultation over the heart and determined on the periphery by palpation. The regularity of the ventricular rhythm depends on the AV-block. A carotis massage, can be applied to set the two rhythm disorders apart, since the AV-block increases upon a parasympathetic activity and F-waves appear on the Electro Cardiograph (ECG) finding which are necessary for diagnosing flutter.

Frequency

It represents the pulse rate which can be frequent i.e. tachycardia exists or it can be rare when we speak of bradycardia.

Amplitude

Upon the examination of the amplitude of the pulse the extent of the pulse is examined which represents the magnitude of the pulse and the flexibility of the arterial wall. The amplitude can be high (altus) or low (parvus).

Suppresibility

The pulse can be tight and full (durus) or soft and easily suppressible (mollis).

The pace of the expansion

The pace of the pulse wave raising our finger has to be watched. The pace of the expansion can be fast (celer) or slow (tardus).

Equality

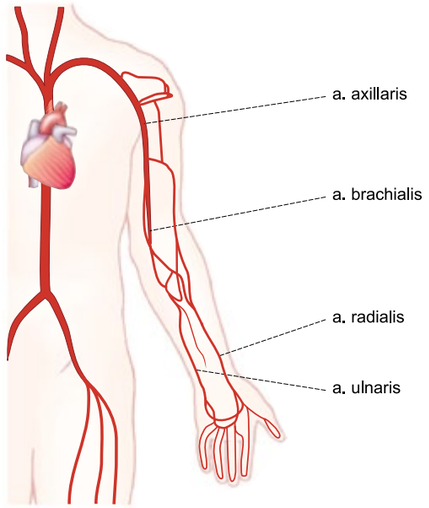
Each pulse wave being equal in quality needs to be assessed. If they are equal, we speak of pulse aequalis, if they are unequal, it is called pulse inaequalis.

If a pulse can be palpated on the upper arm but not on the wrist, it may pertain to low blood pressure.

The places for measuring the pulse are

Upper limb:

- Axillary pulse (axillary artery): it can be found a little downwards from the lateral side of the armpit.
- Brachial pulse (brachial artery): it can be found on the inner surface of the upper arm near the elbow-joint



Picture 6. The arterial system of the upper arm

- Radial pulse (radial artery): it can be found on the lateral side of the wrist
- Ulnar pulse (ulnar artery): it can be found on the medial side of the wrist

Lower limb:

- Femoral pulse (femoral artery): it can be palpated in the curves of the groin
- Popliteal pulse (popliteal artery): it can be found behind the knee, in the hollow of the knee, the patient should hold his leg in an about 124° and then the examiner should find the artery in the hollow of the knee
- Posterior tibial pulse (posterior tibial artery): it can be found on the medial side of the ankle, 2cm downwards aback the inner ankle
- Dorsal pulse of the foot (dorsal pedis artery): it can be found on the foot.

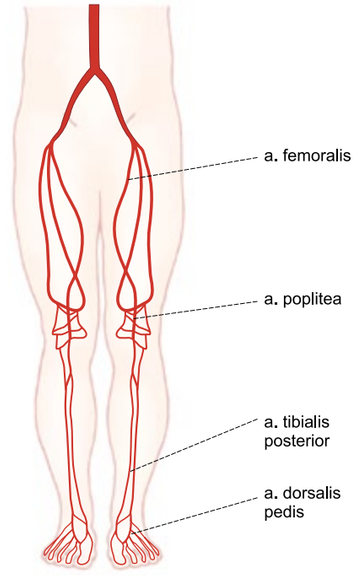
Head/ neck:

- Carotid pulse (carotid artery): it can be found on the lateral part of the neck, in front of the m. sternocleidomastoideus. Upon the palpation of the carotid artery one has to be watchful since the compression of the carotid artery may cause bradycardia or in a severe case it can cause a cardiac arrest due to the stimulation of the vagus nerve which belongs to the parasympathetic nervous system. The simultaneous palpation of the bilateral carotid pulse is strictly forbidden. Before the intervention the examiner must make sure that the inner wall of the artery is free of sclerotic plaques because their detachment may lead to the blockage of cerebral vessels.
- Facial pulse (facial artery): it can be found on the jaw bone in the line of the corner of the mouth.
- Temporal pulse (temporal artery): it can be directly palpated on the temples.

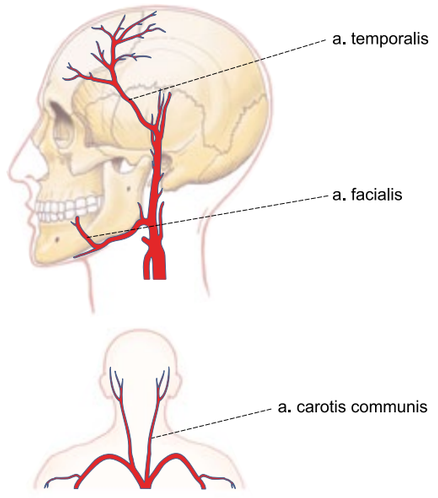
Trunk

- Apical pulse (apex of the heart): pulse can be determined with auscultation at this point in the 5th intercostal midclavicular line.

Examination of the pulse by palpation:



Picture 7. The arterial system of the lower limb



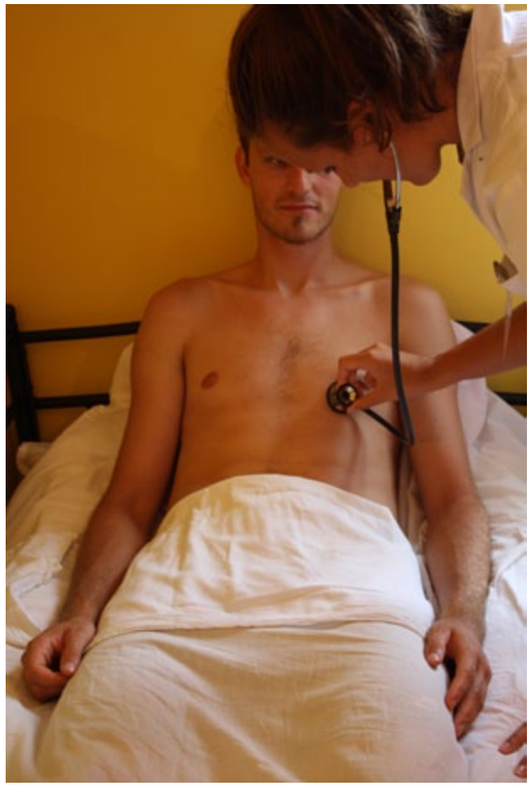
Picture 8. The arterial system of the neck and the face

The examination of the arteries also mentioned above is to be done by their compression to a bony base with the help of two or three fingers. During the examination the rhythm, the frequency, the amplitude, the compressibility, the pace of the pulse and whether the expansions are equal have to be determined. We palpate and count the pulse for 30 seconds and we multiply the received figure by two. The pulse rate is measured for one minute in case of an irregular pulse.

The necessary means for the intervention are:
- a watch with a second hand
- documentation

Pulse examination with auscultation:

It happens with the help of a stethoscope. In this case auscultation has to be done over the heart and the number of heart beats have to be counted for 30 seconds, then multiplied by two. In case the rhythm is irregular, measurement should be done for a minute.



Picture 9. Auscultation of the pulse at the apex of the heart

14-4. táblázat. Pulzusvizsgálat tapintással

	Intervention	Explanation
1.	Disinfect your hands hygienically.	Due to keeping the rules of sepsis-antisepsis.
2.	Identify the patient and inform them about the necessity and process of the intervention.	The patient's fear can be decreased and their willingness to cooperate can be increased this way.
3.	Prepare the patient: a calm environment is needed, the patient should be lying or sitting in a quiet room for at least 10-15 minutes. Preferably they should not talk or be talked to during this time. It is best if the patient is left alone. The staff also has to know if the patient takes positive chronotropic medicines because they influence the test results.	The patient should preferably be as calm as possible, if it is the other way around, we may measure a higher pulse rate. The patient should be left to rest if we want to measure the pulse rate at rest and note its change upon an external stimulus, for example upon physical activity.
4.	Prepare the required devices while the patient is at rest.	
5.	Palpate the pulse by using at least two of your fingers (the most common places for palpation are the radial artery or the ulnar artery, in case of an emergency or in case of rare peripheral pulse a central pulse should be palpated which can be either the carotid artery or the femoral artery)!	We are to use more fingers because if we just used one finger there would be a chance of sensing our own pulsation.
6.	During the examination the rhythm, the frequency, the amplitude, the compressibility, the pace of the pulse have to be determined and also whether each deflection is equal.	
7.	Palpate and count the pulse for 30 seconds and multiply the received result by two. In case of an irregular rhythm measure the pulse rate for one minute. In case of brady- or tachycardia and irregular pulse, repeat the measurement on the other limb, too.	In case of arrhythmia multiplying the data measured during a shorter period of time may give a false result.
8.	Document the received result immediately after measurement.	
9.	Compare the received figures with the ones measured earlier and also take the patient's general status into consideration upon assessment because it can determine the quality of the pulse.	
10.	Disinfect your hand hygienically again.	In order to prevent cross-infections.

Monitor systems

Observing the patients by monitoring equipment can make the work of the health care staff much easier, however it cannot substitute the personal contact between the patient and the staff and the physical examinations and observations by the providers. With its application, the observation and the graphic illustration of several parameters are possible. It is to be applied mainly in case of patients in a critical state or if fast progression can be expected and the patients need observation of an increased extent. Monitoring systems may prove to be of useful assistance during care but only in case the caregiving staff are aware of the functioning principles of the given devices and the normal range of the represented parameters and respectively, the physiological shape of the graphically depicted diagrams.

Below you can find a general discussion of the numerous types of devices applied in everyday practice. The shunting of monitor systems, the major criteria for setting the alarms and the main types of monitors are reviewed.

Alarms:

The alarming parameters of the monitors can be set optionally, taking the patients' and the care providing staff's demands into consideration. The device alerts the staff with a sound signal, with a text message, or by blinking the value of the pathological parameters.

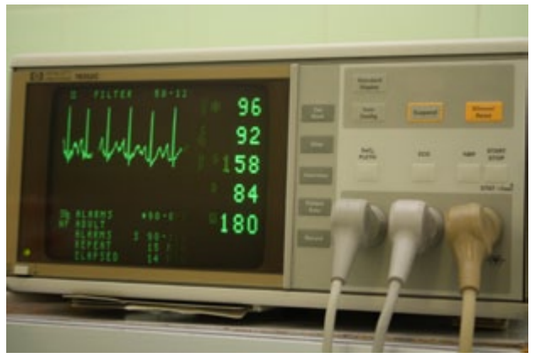
Shuntings:

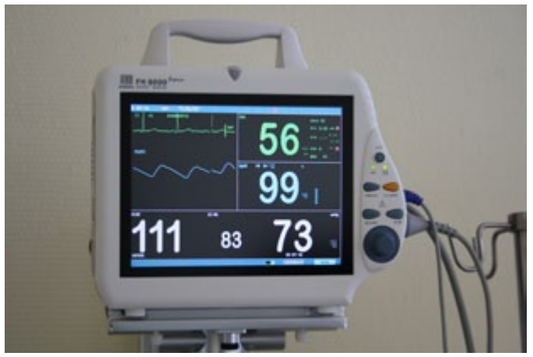
We differentiate between three- and five-electrode systems being connected to monitor systems. Ground cables are generally used in terms of shunting in order to prevent accidental electric shocks. This shunting is supplied with a black colour code (in accordance with TEC). Before the placement of the electrodes you have to make sure that the skin is not injured at the given area. Do not place electrodes over thick layers of muscles and over bony prominences.

Types of monitor systems

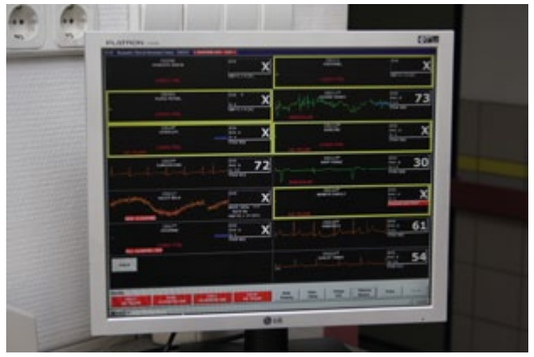
Bedside monitors

In everyday practice a lot of bedside monitoring systems exist, which differ in their forms, sizes, data storage capacity and naturally in the number of parameters that they are capable of measuring. Some monitors can store patients' data being gathered for as long as 72 hours. On the screen several data can be visualized simultaneously in a graphic or numerical form. The nature of the depicted data depends on the demands of the staff or the patient's status.





Pictures 10. Different types of patient observing monitors



Picture 11. Central monitor system

Central monitoring system

Its essence is that some of the patients' parameters, which are observed by the bedside monitors functioning at a hospital ward, are also made visual on a central monitor. It bears significance because the patients being observed by monitors at a ward are not necessarily located in a way that the display of all the monitors can be seen from one point and also the arrangement of the hospital wards might require this type of monitor system.

Telemetry

With its help, the continuous follow-up of the patients is possible even in the whole area of the institution, so they are not limited in their motion.

Modular monitor system

Its essence is that the given patient observing monitor can be expanded by any optional modules, which can assure a wider range of measurements, for example measuring more haemodynamic data is possible.

Breathing

Anatomic and physiological bases

Breathing means the intake of oxygen (O2) and release of carbon-dioxide (CO2). An average adult in rest physiologically consumes 250 ml of oxygen and produces 200 ml of carbon dioxide a minute. A breathing cycle consists of an inspiration and an expiration. During a breathing cycle in rest 500 ml of air flows in and out of the lungs. The number of inspirations is 14-16 a minute. The multiplication product of the latter two constitutes the respiratory minute volume which is 7-8 l/min.

The air exchange between the external air and the alveoli of the lungs and the gas exchange between the alveoli of the lungs and the blood are called external breathing. The gas exchange between the blood and the cells, and cellular breathing also included, are called internal breathing.

Table 5. Physiological respiratory rate in different age groups

Age	Respiratory rate/minute
Newborn babies	35–40
Infants	30–50
Small children	25–32
Children	20–30
Adolescents	16–19
Adults	12–20

Upon inhalation the chest cavity expands in all three dimensions of space due to the active operation of the muscles. Inhalation is created by the functioning of the following muscles, and assisted by: the diaphragm, m. trapesius, m. latissimus dorsi, the major and minor m. pectoralis, m. serratus, m. intercostalis externus. Upon forced respiration there is an active muscle functioning during exhalation as well, the following muscles are in operation at times like that: mm. intercostales interni and the muscles of the abdominal wall.

The lungs do not collapse at the end of exhalation either, they are in a strained state, in the maintenance of which several factors play a role, namely the flexibility of the lungs, the alveolar surface tension and the flexibility of the chest wall. The physiological and anatomical basics of breathing are discussed in more details in the chapter on oxygen therapy.

Eupnoea: it is regular, rhythmic, calm and noiseless with even depth and time span. The proportion of inspiration-expiration is generally 2:3, whereas the rate of respiration and pulse is 1:4.

Pathological respiratory patterns/ breathing types

Dyspnoea

Dyspnoea or in other words shortness of breath (SOB) is the subjective sensation of breathing being difficult. According to the definition given by the American Thoracic society it is a subjectively experienced feeling of respiratory discomfort that consists of qualitatively definable sensations of varying intensity.

Dyspnoea may develop suddenly (e.g. bronchial asthma, acute left heart insufficiency, acute myocardial attack, pulmonary embolism, pneumothorax, pneumonia) or slowly, during several weeks or months (e.g. lung tumour, pleurisy, tuberculosis – TBC), or during years (e.g. COPD, pulmonary fibrosis).

Expirational dyspnoea: expiration is difficult i.e. the air flows out of the airways slower than in case of normal physiological breathing. Bronchial asthma, obstructive bronchitis and pulmonary emphysema are characteristic of ventilational disorders.

Inspirational dyspnoea: inspiration is difficult, most commonly due to epiglottis or glottis. It can develop as a result of airway obstruction. It is typical of krupp syndrome, acute epiglottis and laryngeal subglottis.

Effort dyspnoea: it is called effort dyspnoea because difficult breathing appears upon effort. The patient becomes aware of it only when the functional worsening is already in an advanced stage and nearly half of the respiratory reserves is lost (FEV1 <50%) and this is when the patient shows up with their complaints at the doctor's. According to some views effort dyspnoea is a change that goes with old age but it is usually the symptom of diseases (e.g. COPD).

Orthopnoea: it is a severe form of dyspnoea when dyspnoea develops in a horizontal position, generally following a short sleeping time. Its reason can be a pulmonary disease (e.g. COPD, bronchial asthma) and a cardiac disease (e.g. cardiac asthma). In a sitting position the patient's difficult breathing usually ceases within a short period of time because the midriff moves upwards in a sitting position and thus the amount of the expired air increases and consequently the air content of the lungs at the end of expiration (FRC) and hyperinflation are decreased (Kormos 2004).

Paroxysmal nocturnal dyspnoea (PND): during difficult breathing that generally appears in seizures at night, the patient usually wakes up a few hours after falling asleep for having a sudden, severe dyspnoea developed. Most commonly there is a cardiac insufficiency in the background of PND. Other than that it can be caused by bronchial asthma and chronic obstructive heart disease.

Platypnoea-orthodeoxia: it is the opposite of orthopnoea, i.e. shortness of breath developed in a standing position. The patient's breathing improves in a lying position, however, in a sitting or standing position it gets worse again.

Trepopnoea: it is a form of shortness of breath, which develops when the patient lies on one side, whereas, while turning on his other side, shortness of breath does not occur.

For measuring the subjective assessment of dyspnoea, different types of scales can be used, for example the Borg scale or the visual analogue scale.

Bradypnoea

It is rhythmic, slow respiration with a low respiratory rate. Its reason can be a well-trained physical state, old age, cerebral circulatory disorder, disease of the central nervous system and poisoning (opiates, soporifics).

Tachypnoea

It is rhythmic, fast, superficial respiration with a high respiratory rate. Despite hyperventilation, in case of tachypnoea the reasons for a high respiratory rate are that besides the raise in PCO2 of the blood the composition of the blood changes, the respiratory rate does not exceed the needed quantity (e.g. following physical activity). Its reason can be circulatory insufficiency, respiratory insufficiency, the decrease of the respiratory surface (e.g. pulmonary embolism, pneumonia, thoracic fluid retention), metabolic disorder, fever, carbon monoxide poisoning.

Hyperpnoea

It is fast, deep breathing. Its reason can be physical activity, poisoning (e.g. salicylate overdose), sepsis, considerable geographical height. It rarely occurs by itself, it generally appears accompanied by tachypnoea (see hyperventilation).

Hypopmoea

It is extended superficial breathing which is accompanied by a decrease of respiration exceeding 50% of the average respiratory volume or it is a low respiratory rate. Daytime hypopnoea can be caused by neuromuscular diseases or stroke. In case of sleeping time obstructive hypopnoea the oronasal air flow exceeds 10 seconds and is decreased over 50% or besides a smaller degree of oronasal air flow decrease, an O2-desaturation over 3% and/or consequential awakening occurs. Its reason is the narrowing of the pharynx. It is rare by itself, it generally appears accompanied by bradypnoea (see hypoventilation).

Apnoea

It is the temporary lack of respiration. It can be evoked voluntarily or it can be caused by medicine poisoning (e.g. opiates), mechanical reasons (e.g. suffocation or strangulation), diseases of the nervous system, stroke and trauma. In case of sleeping time apnoea an apneic period occurs (the lack of breathing or reduced breathing that goes below 10% of the average amplitude of the previous respirations) during sleeping at least 10 times an hour and this apneic period is longer than 10 seconds (in case of premature babies it is longer than 20 seconds, with newborn babies it is longer than 15 seconds).

In case of congenital hypoventilation syndrome ('Ondine's curse' syndrome) a central sleeping apnoea and hypoventilation occur. Respiration is normal in an awake state, whereas proper gas exchange is not ensured during sleep. Breathing can be maintained exclusively by the control of the cerebral cortex, it cannot be sustained voluntarily. Its reason is the functional disorder of the respiratory centres of the brainstem.

Hyperventilation

It is rhythmic, fast, forced, deep breathing, the alveolar ventilation exceeds the value necessary for ensuring the physiological PACO2 level and the PaCO2 level decreases below 40Hgmm. It can be caused by stress, emotional effects, generalized anxiety, panic disease, hypochondria (in case of which we speak of neurogenic hyperventilation), pulmonary embolism, pneumothorax, asthma, acidosis, infection (e.g. rabies, encephalitis, airway illnesses), high fever, stroke, mesencephalon leison, pons leison, poisoning (e.g. salicylate), or altitude sickness.

Hypoventilation

It is rhythmic, superficial breathing which is characterized by a low respiratory rate. The alveolar ventilation does not reach the necessary value for ensuring the physiological PACO2 level and the PACO2 and the PaCO2 increase over 40Hgmm and other than this the pH is ≤ 7.42. Its reason can be a neuromuscular disorder, obstructive and restrictive respiratory disorders, the illnesses of the central nervous system, stroke, the decrease of the body temperature and medicines (e.g. muscle relaxants, narcotics, sedatives) (Nowbar, Burkart, Gonzales 2004).

Cheyne – Stokes respiration

It is a periodic respiratory pattern, during which a few-minute-long apnoea is followed by superficial and then gradually deepening respiration, then the breathing gradually becomes superficial again which is followed by apnoea. Its reason can be a damaged respiratory centre, newborn babies' immature respiratory system, hypertonia, cardiac insufficiency, stroke, diencephalon lesion, mesencephalon lesion, the injury of the medulla oblongata, traumatic cerebral injury, brain tumour, cerebral arteriosclerosis, cerebral hypoxia, toxic encephalopathia, losing consciousness, coma and dying. It can occur upon the application of morphine and sedatives and in alcohol and carbon monoxide poisoning. It can appear physiologically with infants (if its rate does not exceed 20%) or in a high altitude environment (besides a low partial pressure oxygen level) during sleep.

Kussmaul respiration

It is abnormally deep, rapid breathing. Its reason is a metabolic disease (e.g. diabetes mellitus, uraemia). In case of diabetes mellitus the cells are incapable of glucose intake, the blood sugar level rises while the cells 'starve' due to the lack of insulin or insulin resistency. As a result of this the decomposition of fats and proteins occurs (gluconeogenesis) and during this process ketone bodies are produced. Fatty acids and ketone bodies are acidic, as a result of which metabolic acidosis develops. Kussmaul breathing is developed in order to compensate acidosis to promote the increased expiration of CO2.

Biot's respiration (ataxic breathing; cluster breathing)

It has an irregular rhythm, upon its occurrence superficial and deep breathing take turns suddenly with apnoea appearing in irregular intervals. Its reason can be the injury of the medulla oblongata due to stroke or a trauma or the pressure of the medulla oblongata due to uncal or tentorial insertion and other than these the application of opiates.

Paradoxical respiration

The chest moves inward upon inspiration and outwards upon expiration. It can be caused by the serial fracture of the ribs or chest instability.

Apneustic breathing

After inhalation characterized by irregular rhythm and variable depth, before starting exhalation breathing stops in an inhalation state (for a few, or even for 10-20 seconds), exhalation lasting for a short time rarely occurs, which is followed by apnoea. It is often mixed with Biot-breathing (Szollár 2005). Physiologically healthy breathing does not occur due to the Herong-Breuer reflex and the operation of the pneumotaxical neuron group. Apneustic breathing may be caused by an illness of the central nervous system (the disorder of the pons, which can be found in the apneustic centre, or bleeding, injury, tumour).

Blubbering respiration

It goes with chest amplitude, a sound is given off upon inhalation and it results in insufficient respiratory volume. It can be caused by upper airway catarrhal illnesses in infants, laryngomalatia, intoxication and injury of the skull.

Gasping

It is a state with continuous exhalation, which is interrupted by rapid, short inhalations, also known as terminal non-respiratory condition. It may result from cardiac arrest, brain injury, stroke, prematurity.

Abnormal respiratory sounds

The four most common pathological respiratory sounds are:

- rale
- snore
- stridor
- gasp.

During rale a little snapping, bubbly or clapping sound can be heard in the lungs which appears when the air opens the closed pneumatic aerial spaces.

A snoring sound can be heard when the route of the air is blocked or uneven in the large airways.

During stridor a wheeze-like, stertorous sound can be heard upon expiration. This is generally due to an obstruction in the trachea or the posterior part of the throat.

In case of narrowed airways we can hear gasping, panting, high sounds upon expiration.

Bad breath – halitosis – foetor

Its classification

We differentiate between two large groups of halitosis, namely the real and pseudo-halitosis. Further subdivisions within real halitosis are the physiological and pathologic ones and the latter can be grouped further to an acute and a chronic subgroup. The phenomenon of psedo-halitosis is more like a psychological problem, since in that case the patient complains about bad breath despite not having a bad breath. Physiological real foetor can be experienced after the consumption of different food (e.g. onions, sausage), drinks (e.g. coffee) and smoking. Chronic pathological halitosis can be further distinguished to an oral and an extraoral subgroup, out of which bad breath of an oral origin occurs in a larger rate.

Extraoral chronic pathological halitosis

Bad breath can be the symptom of numerous chronic diseases, consequently their typical breath type can help in making a diagnosis. In case of diabetes mellitus the breath smells typically like acetone, in case of a kidney disease it smells like ammonia, while upon a liver deficiency the breath smells like fresh meat.. After the absorption of certain poisons (e.g. mercury, arsenic) there can also be a peculiar oral smell.

Oral halitosis

It is most commonly caused by anaerobic bacteria producing sulphuric compounds (e.g. fusobacteria, the Actinomyces), which live in the pharynx and on the back of the tongue among normal circumstances and they play an important role in the digestion and breaking up of proteins. If certain changes occur in their life circumstances, they reproduce rapidly and produce a large amount of volatile sulphur compound.

Légzőrendszeri hangjelenségek

Hiccups – singultus

It is the involuntary contraction of the diaphragm, which is generally repeated several times a minute. The distinctive sound is given by the sudden influx of air into the lungs due to the closing of the epiglottis. It is an unpleasant phenomenon, which is usually harmless and ceases on its own, however, it requires medical care upon rare occasions.

Cough – tussis

It is the fast, loud outflow of the air from the lungs. After inhalation, during the partial closure of the glottis, the air is forcefully thrust out in the air with the help of the supplementary respiratory muscles. It is a defensive reflex, during which the lungs, trachea and the bronchi become purified of irritating substances and discharge. Cough can be productive and unproductive, in the first case phlegm (sputum) is emptied, due to which cough should not be suppressed, while unproductive cough must be relieved.

Sneezing

It is a reflexive movement, caused by the irritation of the nerve endings in the nasal mucosa. The irritation can be chemical or mechanical. Sneezing occurs also in case of a runny nose (inflammation of the mucosa).

The observation of respiration

Upon non-instrumental examinations we observe the respiratory rate, the depth of respiration, the sound of respiration, the breath and the rhythm of the respiratory movements. It is important to do the observation unnoticably, since inspiration can be influenced by the patient for this reason we can, for example, measure the pulse and in the meantime observe respiration as if we were still counting the pulse.

Spirometry

In the examination of respiratory functioning, determining the static and dynamic lung volume is of fundamental importance. It is done by a spirometer which documents the amount of the inhaled and exhaled air and the speed of the air flow. This examination can be done easily, it does not burden the patient and it can be repeated several

Table 6. The observation of respiration

	Intervention	Explanation
1.	Do hygienic disinfection of your hands.	Due to keeping the rules of sepsis-antisepsis.
2.	Identify the patient and inform them about the necessity and process of the intervention.	With this you can decrease the patient's fear and enhance their willingness to cooperate.
3.	Prepare the needed devices and the room for performing the intervention.	
4.	Prepare the patient: they should be lying or sitting in a quiet room for at least 10-15 minutes. During this time, the patient should not talk or be talked to, if possible. It is best to leave the patient alone.	The patient should preferably be as calm as possible, if it is the other way around, we may measure a higher respiratory count.
5.	Palpate the pulse by using at least two of your fingers (the most common places for palpation are the radial artery or the ulnar artery).	We use more fingers because if we only used one finger there would be a chance of sensing our own pulsation.
6.	Examine the pulse for 30 seconds.	It is important not to call the patient's attention to counting their respiration because in that case they may influence its depth and rhythm.
7.	The examination of breathing must be implemented unnoticably, as a continuation of the pulse examination. During the examination the rhythm, depth and sound of breathing need to be determined and also whether each deflection is equal.	

8.	Observe and count respiration for 60 seconds. In case of pathological breathing sometimes more time is required for this examination.	
9.	Document the received result immediately after measurement.	
10.	Compare the received result with the one measured earlier and take the patient's general status also into consideration upon assessment because it can determine the quality of breathing.	
11.	Wash your hands hygienically again.	To prevent cross-infection.

Picture 12. Illustration for a spirometric examination

times after one another in order to measure the best possible value, but even so the examination does not take longer than 4 to 5 minutes.

Blood pressure

Blood pressure is the pressure exerted on the flexible wall of the vessels. Blood pressure count changes during a cardiac cycle, during systole and diastole and besides, it shows a different value at the various points of the vascular system.

Factors influencing blood pressure

When blood pressure count decreases below the physiological level, it is referred to as hypotension, whereas when it rises above the physiological level, it is called hypertension. Blood pressure is determined by the amount of blood flow and peripheral resistance and it is influenced by a number of factors, such as age, muscular work, body position, pregnancy, sleep, gender and emotions. From birth to puberty, blood pressure rises, and then it is set at the physiological value of 120/80 Hgmm. When muscle work is carried out, the systolic blood pressure value may reach the level of up to 200 Hgmm, whereas the diastolic blood pressure physiologically cannot rise above 100 Hgmm even during muscle work. On the basis of body position, when a lying position is changed to a standing position, blood pressure physiologically rises by 10 to 15 Hgmm. During pregnancy there may be a slight rise in blood pressure. The changes in blood pressure during sleep is consistent with the periods of sleep, according to which during slow-wave sleep (SWS) it decreases, while it may rise as a result of the images appearing in dreams during rapid eye movement (REM) phases. Until reaching the period of menopause, women's blood pressure may be on average 10 Hgmm lower than that of men. An individual's emotional state can significantly influence blood pressure, for example there is a considerable increase of blood pressure in stressful situations.

Since blood pressure is partly influenced by the peripheral resistence and partly by the blood flow, the neural, reflexive and humoral regulations of blood vessels are significant factors.

Primary (essential) and secondary hypertension can be distinguished. In case of primary hypertension there is no objective alteration in an organ that can be detected as a cause for the disease, whereas in case of secondary hypertension high blood pressure appears as the symptom of a developed pathography.

Normal and pathological blood pressure categories

According to the new definition of normal blood pressure value the systolic finding of blood pressure is less than 120 Hgmm and the value of the diastolic blood pressure is less than 80 Hgmm. The risk of cardiovascular diseases doubles with each 20/10 Hgmm increase in blood pressure above a 115/75 Hgmm blood pressure finding.

Due to the above mentioned data, according to the recommendation of the international scientific literature in case of a prehypertensive stadium (120-139/80-89), which corresponds to the normal and increased normal blood pressure categories in Hungary, a change of life style and consequently lower blood pressure have to be achieved by the more intensive education of clients in order to prevent hypertension.

The USA Joint National Comittee (JNC) published its guidance referring to the categorization of normal and high blood pressure in 2003 in which it called the systolic blood pressure between 120-139 and/or the diastolic blood pressure between 80-89 prehypertension. The European Society of Hypertension (ESH) and the European Society of Cardiology (ESC) and in accordance with them, the Hungarian Society of Hypertension also decided not to use this terminology. The Hungarian recommendation is in agreement with the recommendation of the European Society of Hypertension (ESC) and the European Society of Cardiology (ESC).

We speak of high blood pressure (hypertension) if the blood pressure that was measured among clinical circumstances or at the G.P.'s surgery, while keeping the regulations about the surroundings of blood pressure measurements, at least three times (having a minimum of one-week breaks in between the measurements) and during each occasion the blood pressure was measured at least twice and their average equals or is over 140 Hgmm in terms of the systolic value and equals or is over 90 Hgmm in terms of the diastolic value.

We speak of „white coat" hypertension or isolated clinical hypertension if the blood pressure measured by the health care staff is high, whereas blood pressure is normal outside a health care environment. A „white coat" hypertension can be in the background of high blood pressure in 20% of male cases and in 54% of female cases. A 24-hour blood pressure measuring is necessary to exclude this option. Hypertension may develop in a 1-8 year larger rate in case of patients with „white coat" hypertension and that is why monitoring has to be repeated after 3-6 months.

In case of masked hypertension the blood pressure measured in a health care environment is normal, while the 24-hour blood pressure measurement at home verifies hypertension (Julius 2006).

It is known that hypertension is a major risk factor for coronary diseases, acute myocardial infarction or stroke, consequently its treatment or decreasing it below the limit values is essential. Research has shown that complications can be reduced as soon as in six months in case of hypertensive patients, if the systolic blood pressure gets below 140 Hgmm. The treatment of hypertension results in complication reduction in the rate of 24% for cardiovascular events, in 40% in case of stroke and total mortality drops by 21% (Jarvis 2004).

We can speak of chronically low blood pressure (hypotension) if the systolic blood pressure durably does not exceed 100 Hgmm (young people).

Table 7. Normal and pathological venous pressure measured clinically (JNC 2003, ESH 2007

The classification of the Joint National Committee				The classification of the European Society of Hypertension and European Society of Cardiology			
	Systolic bloodpressure (Hgmm)		Diastolic blood pressure (Hgmm)		Systolic blood pressure (Hgmm)		Diastolic blood pressure (Hgmm)
Normal blood pressure	<120	and	<80	*Optimal blood pressure*	<120	and	<80
prehypertension	120–139	or	80–89	*Normal blood pressure*	120–129	and	80–84
				Increased normal blood pressure	130–139	and/or	85–89
I degree hypertension	140–159	or	90–99	*I degree hypertension*	140–159	and/or	90–99
II degree hypertension	≥160	or	≥100	*II degree hypertension*	160–179	and/or	100–109
				III degree hypertension	>180	and/or	>110
				Isolated dyastolic hypertension (IDH)	<140		>89
				Isolated systolic hypertension (ISH)	≥140		<90

Orthostatic hypotension or postural hypotension is spoken of in case the systolic blood pressure decreases by at least 20 Hgmm and the diastolic blood pressure decreases by minimum 10 Hgmm after standing up compared to the values at rest measured after having been in a lying position. Its occurrence increases with aging, 25% of the population over the age of 65 are subjected to this disorder, but it is also known as a complication of many diseases such as diabetes, for example. The diagnosis of chronic orthostatic hypotension can be determined on the basis of the blood pressure value measured in a standing position after meals, since in positive cases a significant decrease can be detected compared to the findings measured in a sitting position (Jevon 2001).

Blood pressure measurements that enable us to draw the correct conclusions concerning a client's blood pressure can have several obstacles. The fluctuation originating from the daily (circadian) rhythm of blood pressure (which can even reach as much as 20 Hgmm), belongs to these factors. In connection with this, it can be stated in general that blood pressure is higher during the daytime hours and lower at night.

Vérnyomásmérés

Blood pressure measuring techniques and types of blood pressure measuring gauges (sphygmomanometers)

Blood pressure measuring can happen in an indirect (non-invasive) way, or in a direct (invasive) way.

Table 8. The Korotkov sounds are:

The phase of the sound	The nature of the sound	The clinical significance of the sound
1st phase	The appearance of sharp, clear, tapping sounds.	The beginning of this first phase, i.e. the appearance of the sounds is the value of the systolic pressure (which coincides with the appearance of the palpable pulse).
2nd phase	The sounds are quieter (humming noise, swish) and longer (extended).	
	Gallavardin's auscultational gap	
3rd phase	The sound becomes stronger, it can be heard in a sharper and louder way.	
4th phase	The sounds become dull and quieter.	In the past, the end of the 4th Korotkov sound, when the sound was barely audible, meant diastolic pressure.
5th phase	The lack of sounds.	At present the 5th Korotkov sound i.e. the disappearance of sound is considered the diastolic blood pressure since it can be sensed more unambiguously and can be easily repeated.

Nikolai Sergeyevich Korotkov first discovered blood pressure measurement and developed the Korotkov sounds. The basis of this, is that the blood flow in normal vessels is laminar and layered i.e. it is characterized by faster axial flow and slower rim flow (physiologically turbulent flow occurs in the ascendent aorta). Korotkov actually supplemented Riva Rocco's method with auscultation, which made the determination of diastolic blood pressure possible.

Indirect (non-invasive) blood pressure measurement:

Blood pressure can be taken both on the upper limbs (upper arm, wrist, finger) and on the lower limbs (thigh). During manual blood pressure measurement auscultational and palpational methods are applied.

Auscultational method (Riva-Rocci, Korotkov method)

Pressure of such a degree is produced by inflating the cuff, having been placed on the upper arm, to a value which is over the expected systolic value, that blocks the circulation of the brachial artery. When the pressure is decreased by lowering the cuff with a speed of 2-3 Hgmm/sec, the flow starts again in the brachial artery and the pulse becomes palpable. In case of a manual blood pressure measuring technique, the sound can be heard with the help of a stethoscope placed onto the elbow-joint, over the brachial artery. Out of the non-invasive techniques, this method spread most commonly in everyday parctice. Momentary systolic and diastolic blood pressure values can be measured with this method, arterial midpressure cannot be determined with the auscultational method.

Palpational method

The palpational method gives an opportunity to determine only the systolic pressure. While letting down the blown up cuff which blocked the circulation of the brachial artery, the flow begins again and the pulse becomes palpable. The examination is done by palpating the radial artery.

Mercurial blood pressure measuring technique

In the course of using a mercurial blood pressure measuring technique the cuff can be inflated within a closed system which contains air, with the help of a balloon. The pressure put on the mercury changes in accordance with the pressure change of the cuff, as a result of which the value of blood pressure is indicated by the height of the mercury column on a vertical scale of numbers which is given in mercury millimetres (Hgmm) and kilopascals. In case of a weak pulse, atrial fibrillation, hypertension induced by shock, tremor or convulsions this blood pressure measuring device gives the most authentic measuring results. At the same time it is important to know that based on the departmental order by the Ministry

Table 9. Blood pressure measuring with auscultational method (with palpational method)

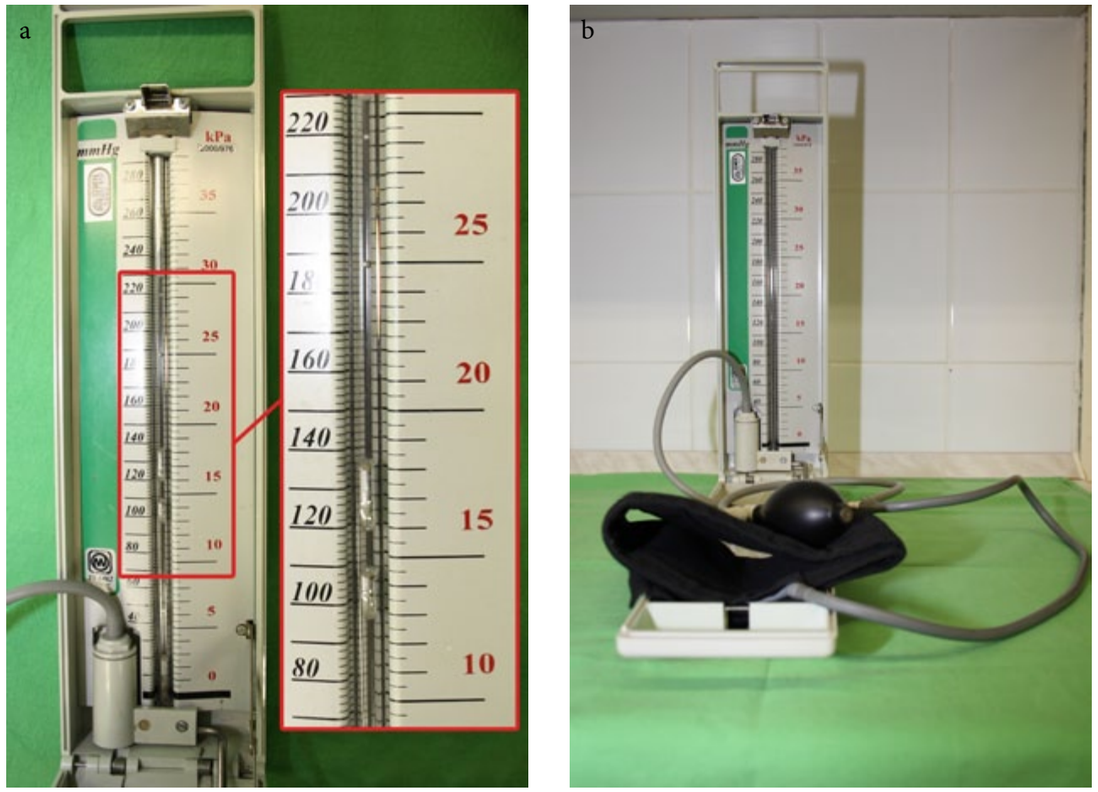
	Intervention	Explanation
1.	Disinfect your hands hygienically.	Due to keeping the rules of sepsis-antisepsis.
2.	Identify the patient and inform them about the necessity and process of the intervention.	You can decrease the patient's fear and increase their willingness to cooperate with this.
3.	Prepare the needed devices and the room for performing the intervention.	
4.	Prepare the patient: they should be sitting or lying in a quiet room for at least 5 minutes. During this time, they should not speak or be spoken to, if possible. It is best if the patient remains alone. They should not have anything to eat or drink half an hour before the examination, they should refrain from drinks containing caffeine.	The patient should preferably be as calm as possible, if it is the other way around, we may mistakenly measure a higher blood pressure. Strain in the muscles may result in similar consequences.
5.	Ask the patient to sit down on a chair or lie down if they have not done so until now, then make their arm available, there should not be any clothes on it that could disturb the placement of the cuff.	In case of healthy individuals there is a minimal difference between blood pressure being measured in a sitting, standing or lying position. Generally it is recommended to measure blood pressure in a sitting and also in a standing position in case of old patients, or those who take medicine that causes hypotension, and in case of inexplicable faint. Blood pressure should be measured on both arms of the patient for the first time. If the difference between the results of the two arms is bigger than 20 Hgmm in terms of the systolic blood pressure and bigger than 10 Hgmm regarding diastole, further examinations are needed to ascertain the cause.
6.	Select the proper sized cuff.	The inflatable sack of the cuff should cover 80% of the patient's upper arm. Its width should be 40% of the round bulk of the upper arm. Blood pressure might be overestimated if the inflatable sack of the cuff is too small, and underestimated if it is too large.
7.	Put the previously selected cuff onto the patient's arm 2 cm over the curve of the elbow. The patient's arm should be supported and sligthly bent.	The cuff should be neither loose nor too tight. The middle of the inflatable sack of the cuff, where the connecting tubes are attached, should face towards the brachial artery.
8.	Make sure that the patient's upper arm, where we put the cuff, is at the height of the heart.	If the arm is not supported or the patient tightens his muscles during measurement, we may get a higher blood pressure value. If the arm is higher than the level of the heart, we may overestimate the diastolic pressure by as much as even 10 Hgmm.
9.	Determine the place of the brachial artery by palpation, leave the fingers in the given position. Inflate the cuff up and estimate the patient's systolic blood pressure value and then deflate the cuff. The systolic value will be the one when we palpate pulsation over the brachial artery again.	This process is also necessary in order to eliminate the error options due to the auscultational gap. The systolic value can also be estimated by the palpation of the brachial artery. (This latter technique is more widespread in Hungary.)
10.	Place the stethoscope over the brachial artery.	Do not exert too large pressure on the stethoscope and do not put it under the cuff because it leads to the obstruction of the brachial artery, so the Korotkov sounds can be mistaken.
11.	Blow the cuff up again 30 Hgmm higher than the previously determined systolic value.	
12.	Gradually let the cuff down with the help of the valve.	The recommended speed for letting down the cuff is 2-3 mms/sec.

13.	Document the measured results.	The systolic value is the first Korotkov sound, the diastolic value (the lack of sound) is the fifth Korotkov sound. In case hyper-, or hypotension is detected, notify the head nurse on duty or the assigned doctor.
14.	A few minutes later repeat the measurement on the same arm.	The official measurement result should be the one with lower values.
15.	Wash your hands hyhienically again.	In order to prevent cross-infections.

of Health and the Ministry of Public Health No. 41/2000 (December 20) and the joint departmental order of the Ministry of Health Care and the Ministry of Environmental Protection and Water Conservancy No. 41/2008 (October 30) mercury is not allowed to be put into circulation in measuring devices as for example in blood pressure measuring gauges that are intended to be distributed for population sales. Blood pressure can be determined with auscultational and palpational methods when a mercurial sphygmomanometer is applied.

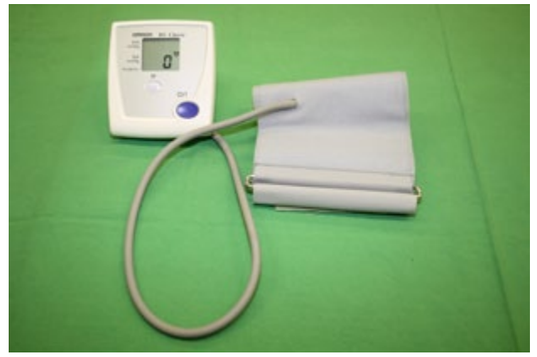
Aneroid blood pressure measuring technique

Upon Bourdon's blood pressure measurement the cuff can also be blown up with the help of a balloon in a way that was already introduced in relation to the mercurial blood pressure measurement. In accordance with the pressure alterations of the cuff a metal cylinder gets pressed together or expands, which movement is made visual by an indicator on the scale of the manometer. The determination of the blood pressure values can also happen by auscultation or palpation.



Pictures 13. Mercurial sphygmomanometers a) Defective device; b) Well-functioning device)

Picture 14. Aneroid blood pressure measuring device



Picture 15. Oscillometric automated blood pressure measuring device

Oscillometric method

The functional principle of the device is that the pulsation caused by the flow beginning repeatedly, while letting down the inflated cuff which obstructed the circulation of the artery, also appears in the pressure of the cuff (oscillometric pulse) placed on the upper arm. The pulsation reaches its maximum value when the pressure of the cuff equals the arterial midpressure and then it gradually decreases. So the method is suitable for the direct measurement of arterial midpressure, however, the systolic and diastolic values are determined indirectly, by calculations.

ABPM (Ambulatory Blood Pressure Measurement)

It is a method based on the principle of oscillometric blood pressure measurement which makes blood pressure measurement possible for a 24-hour period. The device measures and records the patient's blood pressure values for 24 hours. With the application of the ABPM the patient's blood pressure profile can be determined much more precisely, so the treatment and also the medicinal therapy is more realistic and cost-efficient.

Other than these more common blood pressure measuring methods, additional methods can also be applied e.g. the ultrasound method, the pulse wave measuring method, tonometric method etc.

Groups of patients requiring special considerations in terms of blood pressure measurement are:

- Children: the younger a child is the smaller the probability is that an authentic blood pressure value can be measured and repeating the process can also be difficult, so it is more like determining the systolic value which is relevant.
- Overweight patients: selecting the appropriate sized cuff and removing tight clothes which influence blood pressure measurement are important.
- Arrhythmia: in case of bradycardia letting down the cuff should be done more slowly than under normal circumstances (norm. 2-3 mm/sec) and in case of a weak pulse, atrial fibrillation, hypertension induced by shock, tremor or convulsions the oscillometric blood pressure measuring technique has to be avoided.

During blood pressure measurement letting down the cuff too slowly or too fast may be the source of further mistakes. In terms of cuffs, the proper size of the rubber sack needs to be paid attention to as well. The measurement can be obstructed if the connecting tube of the rubber sack is ruptured or if we use a mercurial device, it has to be checked whether the mercury got caught.

Patient education done by nurses is a fundamental basis of the treatment of essential hypertension, since it is a chronic illness and therefore its treatment is a life-long process. The patient's attention has to be called not to stop pharmaco -therapeutic treatment even if the blood pressure values measured at home or in the doctor's surgery are within the nor-

mal range because it is the result of the medicinal treatment and also that in case of the occurrence of any side-effect not to change therapeutic their dose but to cross-check it with their therapist or G.P. Upon taking anti-hypertensive medicine, side-effects may occur which are reactions to the active agents of the medicine on the one hand, and originate from the organism having been used to a durably raised level of blood pressure, so initially the patients endure lower (normal) blood pressure with difficulties. At such time dizziness, headache may appear but generally the complaints cease following the first half year of the treatment.

The basic aspects of non-invasive blood pressure measurement applications

Things to be done prior to blood pressure measurement:

The patient should refrain from drinking any fluid half an hour before blood pressure measurement (especially drinks containing caffeine), from eating anything in order to allow gastric emptying to take place. Blood pressure measurement should be done in a quiet, calm room with proper temperature. The patient should be left alone for at least 5 minutes, during which time the client should sit down on a comfortable chair, their back should be supported, they should avoid any sort of physical activity and talking which can influence the measured-to-be blood pressure value.

Tasks during blood pressure measurement:

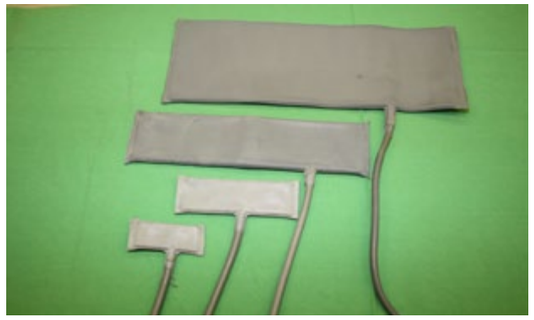
The patient must be informed that it is necessary for them to sit on the chair comfortably and their feet have to be on the floor. During blood pressure measuring the patient needs to be warned not to move, not to move their arm and not to talk because unrealistic values might be attained that way. Blood pressure should be measured on both arms of the patient if it is the first time of measurement. Blood pressure is the lowest in a lying position, it raises in a sitting position and it is the highest in standing position. If the back is not supported and when the patient crosses their legs, both the systolic and the diastolic findings are influenced, as well as the deviations in the levels of the heart and the upper arm do. For the correct measurement of blood pressure it is important that the arm is supported during the measurement, the best method of which is to hold the patient's arm at the elbow.

A properly installed and inflated sack in the appropriate size is needed for accurate blood pressure measurement. This guarantees that the pressure of the inflated cuff blocks the brachial artery and prevents circulation. If the sack is too small, the measured blood pressure value will be higher than

Picture 17. The correct measurement of blood pressure. Determining blood pressure by auscultation

Picture 16. The correct measurement of blood pressure. Determining systolic blood pressure by palpation

Picture 18. The correct measurement of blood pressure. Measuring blood pressure for a lying patient



Picture 19. Various sized rubber sacks

the real blood pressure, whereas if the sack is too large, the measured blood pressure value will be lower than the actual blood pressure.

The cuff has to be placed 2 cm above the elbow-joint and extra attention must be paid to its being neither tight nor too loose. The middle of the rubber sack that can be found in the cuff, where the connecting tubes are attached, should face towards the brachial artery. The position and run-down of the artery has to be determined by palpation.

Picture 20. Disinfection of a blood pressure measuring cuff

Upon one occasion repeat the measurement at least two or three times and calculate the average of the meaured values. Between two measurements there should be at least 1-2 minutes. Finish measuring when there is no larger difference between the values of the two measurements than 4-6 Hgmm.

Tasks after blood pressure measuring are:

After the measurements, take care of your duties related to documentation, the measured values should be told to the patient and the therapist as well. After application the cleansing of the blood pressure gauge and the stethoscope also need to be taken care of.

Direct, invasive blood pressure measuring:

There is a possibility for the invasive, continual and precise measurement of blood pressure with the help of inserting a cannula into the given artery or vein. Invasive blood pressure measurement can be done by the application of an extravascular or intravascular pressure sensor.

Invasive arterial blood pressure measurement:

An invasive arterial blood pressure measuring can be done by using an extravascular or intravascular pressure sensor. Its application is justified if direct blood pressure measuring is not possible or the continuous monitoring of blood pressure becomes necessary (e.g. in case of haemodynamic instability, sepsis, shock, cardiac dieases, heart or vascular surgical intervention). Besides the invasive blood pressure measurements, the application of an arterial cannula allows, if necessary, frequent arterial blood gas analysis and drawing blood and the ingestion of certain effective agents (e.g, giving dosages of pressoramines) as well.

Nowadays, in practice, we can come across mostly extravascular pressure sensors, so in order to be able to measure the pressure the external transducer must be connected to the inserted arterial cannula. The overpressurized mountings and the transducer used for arterial pressure measurement can be found in a pre-packaged form, arranged by the manufacturer (a separate arterial (red) one, and a venous (blue) one, their connection to the monitor is different, too).

Invasive measurement of central venous pressure (CVP measurement):

Invasive central venous pressure measurements are also feasible electronically by the application of intravascular and extravascular pressure sensors and also by a water column manometer technique, the operation of which is based on the principle of communicating vessels. Its indication may be, if the continuous observation of the intravascular volume is necessary (e.g. the danger of pressure change in the pulmonary circulation, the examination of the right heart pump function, the diagnostics of an unexpected drop in blood pressure, shock, renal failure, follow-up of volume replacement).

Today, the electronic measurement methods applied according to the method reviewed in connection with the extravasal pressure sensors are accepted as up-to-date methods.

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15. Pain and Pain Management

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Introduction

Pain is present in our life from the time we are born. As a newborn baby and as an infant pain manifests itself as an instinctive behavioural pattern which is demonstrated in crying, whereas in adults it is accompanied by conscious, analytical, determining type of behaviour. In the course of evolution pain has accompanied humanity and every era had its own philosophy for the interpretation, place and role of pain. Different cultures strived for mitigating pain in accordance with their traditions. The experience gained in this manner survived for many centuries and thousands of years and was part of the medicine of the given society. Pain has been defined in many ways by many people. Several theories have been developed regarding the origins of pain and even today efforts are being made worldwide to understand it. Numerous scholars', great thinkers' and doctors' names can be found in the historical descriptions regarding pain relief, the philosophical approach to pain and the research related to it.

Pain is subjective, it is our own, no one can assess a given experience of pain other than us. Many times we do not understand why being exposed to the same influence causes pain on one occasion and not an unpleasant experience on another. Pain may be triggered by various types of stimuli, e.g. mechanical, chemical or heat exposure. According to one of the most well known definitions, pain is a behavioural response to a potentially tissue damaging stimulus. It is difficult to comprehend why pain is not felt by an injured football player when he is just about to score a goal on the football field, or a fleeing soldier who has been shot, a restaurant customer having hot fisherman's soup or a couple being involved in intense love making during a normal sexual intercourse.

Earlier notions about the origin of pain were refuted one by one, it seems that we need to break up with some traditionally perceived as true theories. It is not true that the excitement of nerve endings specialized in pain cause pain, there are no so-called pain receptors. In some cases not only potential but obviously tissue damaging stimuli do not result in any pain, however, intense pain may develop without any damaging stimuli in a physical state characterized by complete peace of mind. The same impact may cause an intense pain experience in the same individual on one occasion while at other times, during a different course of action it may remain unnoticed. The degree of pain cannot be measured or estimated by an outside observer due to its subjectivity and individual variability. According to modern theories, pain becomes conscious in the brain, that is where we are able to locate it, to determine its degree, to store it in our memories and compare it with our prior memories. Subsequent to this one's pain is reflected in one's behaviour, mimicry, use of language i.e. in the full range of behavioural response.

The assessment of pain in the world

Pain has been present at all levels in the course of the evolution of humanity. Primitive people considered the ordeals that they had suffered from to be of divine origin. The higher level of development characterized in a society, the more people were driven to find rational and scientific explanations. The scientific and technological progress has exponentially accelerated in the last 150 years, which has led to the development of descriptive sciences, natural sciences, including medical science. Being in the possession of scientific facts based on sophisticated, reproducible experiments the Western civilization could feel entitled to consider the medical science it had created to be superior. This inevitably meant the rejection of the medicine of Eastern cultures. It is written in the Bible, in the book of Job that pain strengthens the faith towards the Lord. Humility has been a Christian virtue until the present day. Jesus's suffering and self-sacrifice on the cross meant the end of his earthly existence on the one hand and the indication of the path towards God on the other hand. The few-hundred-year-old scientific results as opposed to the several-thousand-year-old religious interpretation of pain hardly mean anything to believers. In this way it is difficult to accept the criticism against the traditional 2000 or maybe 4000-year-old Chinese healing art or against the Vedic teachings of India from the part of Western civilization. Pain is an independent entity, no matter whether there is a determining underlying disease or not. The art of Chinese medicine tried to establish the harmony, the balance of the body and the spirit in an expressly practical way. However, technological development arrived in China as well and the traditional healing methods have been replaced by modern Western medical techniques. Acupuncture had been driven into the background and then revived again. It was exactly the advanced Western technology, namely the functional magnetic resonance imaging (fMRI) examination that has proved its efficiency. In this way acupuncture is now an accepted method, suitable for therapy and anaesthesia as well in a number of European institutions and pain relieving centres.

Even less is known about the Vedic teachings of India which are believed to date back to a 10,000-year-old history according to the people of India. The book including teachings about health and life is the Ayurveda. Very little information is available on the traditional medicine of India and their effects. They excel mainly in botany, in establishing the balance of body and mind, which is easy to see if we just consider the decoctions, extracts, various types of balm and yoga made in India. There is also an extremely important result concerning the establishment of spiritual balance in terms of pain, e.g. when a fakir endures damage apparently painlessly without a blink of the eye even if physical damage goes as far as self-mutilation.

In other parts of the world where people live in smaller or larger tribal communities, pain is accepted in various ways. The interpretation and value of pain varies due to the religious, ethnic and upbringing differences. The occurrences of diseases with the pain associated with them rise due to the accelerated rhythm of life, the increased life expectancy and getting further away from the Christian religion. The demand for pain relief has grown. Painlessness is one indicator of health, well-being and coming up to the expectations in one's work. The right to be relieved of pain and the right to live without suffering are fundamental human rights recognized and accepted all over the world. Unfortunately, conditions in many countries of a low social economic level are not favourable in ensuring these basic human rights.

The history of pain and pain management

Pain is as old as mankind is, just as the pursuit to relieve pain. Conclusions can be drawn about the prehistoric people's practices to dispel pain based on the ancient and modern written records that we have inherited from tribal peoples. It is assumed that the Palaeolithic people considered pain the punishment of the gods and tried to chase out the evil spirit from the body by making noises, smoking, magic spells and rituals. Making the body rest, being positioned in a peaceful way during the magic spell may really have helped. After a while dancing, singing, the joint chanting of the whole tribe excluded consciousness from the external world along with the pain. The magic spells have been preserved for thousands of years in various forms, which depended on the given cultures and they can be observed in the inherited written records of the Inca and Aztec cultures that still existed a few hundred years ago and in the traditions of today's ethnic groups and tribes that have survived and still live.

In the course of applying magic spells a new phenomenon appeared, namely the first mind-altering plant substances that were thrown into fire and their smoke could be inhaled by the whole tribe. The seeds of a well-known plant, known today as wild hemp from India, were also found near an early Stone Age burial site, used at a ritual fire place. In the Neolithic era, around 3100 BC, writing was invented in Mesopotamia which spread along the rivers to Egypt (Nile), India (Indus) and China (Yellow River).

In the meantime another plant was also grown in Mesopotamia around 3400 BC., which was the joy plant, the hul gil as the Sumerians called it, and their knowledge about the advantageous features of this plant was forwarded to the Assyrians and Babylonians. Then the information got to Egypt, where growing poppy seeds began around 1300 BC.

For healing and pain relieving purposes the Egyptian healers used electric eels, which were placed on wounds. In this way they established the bases for today's well-known percutaneous electrical nerve stimulation i.e. for the TENS treatment (transcutan electric nerve stimulation).

A third plant must be mentioned, which used to be part of the diet at the present-day area of Mexico and Ecuador 7500 years ago and was already grown in 4000 BC. This is pepper, the hot substance of which i.e. capsaicin was used in the treatment of pain by the Central and South American ancient cultures.

It is interesting that writing appeared in Central America as well, regardless of its appearance in Mesopotamia and then they started to apply skull trepanation with considerable success. At the period of the Incas, the survival rate was 80-90%.

According to some sources the skin was punctured with the help of small sharp rocks and painful abscesses were opened at the present-day area of China in the Stone Age, in 2000 BC or as some sources say in 4000 BC. This is where acupuncture is believed to originate from, during the classic application of which it was based on using 9 types of sharp tools, or later needles, each of which having served different purposes. Chinese medicine attempted to systematize and treat diseases as early as around 1500 BC. In the treatment of diseases at least 50 essential plants were used, which include cannabis, ginseng, the snake wood of India, wormwood, cinnamon, tea, ephedrine, Chinese cucumbers, willow (salicylic acid - the future Aspirin), the active ingredients of which are also well known in today's medicine. However, Chinese medicine tried to find the harmony between the living and the deceased ancestors and also between the good and evil spirits that populate the earth. The Yellow Emperor, Huang Di, who is regarded to have set the foundations of the Chinese civilization and tradition, is said that he lived from 2697-2597 BC. His works include the presumably oldest medical book, the Yellow Emperor's Inner Canon, which contains internal medicine and aims to establish inner balance. In his book he deals with the balance of Yin and Yang, white and black, health and disease, the issue of the Qi (energy), the five elements, and he also laid the foundation for good nutrition, what food should be consumed with what and which types of food are advised to abstain from in case of certain symptoms.

A huge book of medicines and a wide range of surgical instruments revealed that in India pain was treated when possible. Indian plant extracts, mixtures and balms have been available in an almost inexhaustible number of combinations until today.

For thousands of years the South American natives chewed coca leaves, which contain a number of alkaloids, nutrients, including cocaine, as it was later called. Archeobotanical evidence suggests that these cultures used the coca leaves and coca fluid for anaesthesia, for skull trepanation!

In ancient times, in Homer's Iliad six different groups of words can be found that refer to pain.

Hippocrates, who is considered to be the father of Western medicine, whose primary teaching was about the examination of the patients rather than the diseases, was the symbol of rational and compassionate medicine for a long time. In the Hippocratic collection pain bears a great significance. He observed that in many cultures the skull was trepanned so that the pain could come out. He named the method called trepanatio.

Roman medicine was built on Greek traditions and influence. Galen was its eminent representative, who categorized patients into four groups, namely into the phlegmatic, sanguine, melancholic and choleric group. His name is associated with the expansion of the Theriac to approximately 70 components, which was applied as a panacea for nearly 1800 years from Europe to as far as China. He performed several dissections of monkeys and pigs and carried out vivisection. His ideas on circulation had been maintained until Harvey appeared and supported the idea that the brain controlled the muscles through the nerves.via his nerve ligatures.

During the time of Alexander the Great military surgery had a great role and also pharmacology that was based on botanical traditions and the teachings of Galen.

In medieval Europe medicine was not favoured. Numerous Greek and Roman writings were destroyed, as they were considered heretical. The oppression of scientific inquiry and experimentation meant the most serious damage. Opium disappeared from Europe for hundreds of years and anything that came from the East was considered satanic in the eyes of the Inquisition. The occult sciences, alchemy and quackery quickly developed from the former Egyptian, Greek and Roman astrology and mythology. Thank the Arab world that the art of medicine could survive. Other than salvaging the teachings and values they were good at botany and chemistry and by this they set the foundations of modern pharmacology. They carried out observations, built hospitals where they helped those who were suffering. One of their most important representatives was Avicenna (980-1037), an influential teacher, doctor and philosopher, whose most valuable work is the Canon of Medicine, which has had many translations and editions, and played a role in the European, British medical education even in the 17th century.

In the meantime the art of healing was flourishing in China.

From 1527 on, opium returned to the medical practice with Paracelsus's laudanum in the era of the Reformation. Opium was already widely used at this time but Paracelsus combined the powder and its sticky rubber-like forms with alcohol, producing Laudanumot this way, which was later modified with sherry and vegetable substances by Thomas Sydenham, a chemist. The Sydenham Laudanum was in use up to the 19th century. His tablets and pills were very effective and popular painkillers.

According to René Descartes 1596-1650, French philosopher and mathematician, pain is the direct product of damaging impacts (noxa), which activates the specific pain path from the receptors in the skin through the nerve fibres to the pain centre, where the mechanical behavioural response is induced.

In 1803 Friedrich Sertürner isolated morphine, the active alkaloid of opium.

Cold water and ice is assumed to have been used for pain relief in prehistoric times as well but the first written traces of their application can be found only in ancient Greek medicine. The production and consumption of alcohol and wine was widespread in the Greek and Roman empires and in particular in the time of Alexander the Great but data that would suggest that it was used for pain relief is not available. In the Middle Ages the effects of alcohol were well known, travellers, sailors used it to open wounds and for amputations.

Ambroise Paré, a French surgeon in the 16th century applied a strong pressure down, a nerve ligature to mitigate pain during surgical interventions of the limbs. The bleeding and pain decreased, so in 1784 James Moore and then in 1875 Johannes Esmarck refined the technique further using a rubber clamping band.

Joseph Priestley, a chemist, discovered nitrous oxid in 1772. In 1800 Humphry Davy described its analgesic effect but 44 years passed before doctors started to use it for relieving pain.

Diethyl ether was synthesized by Valerius Cordus in 1540 but Paracelsus discovered its analgesic effect.

Barbituric acid was produced by Adolf von Baeyer, a German researcher, in 1864, which provided the pharmacological basis for future intravenous anaesthesia. Chloroform was discovered in 1831 and it was first used in childbirth in 1847 by James Young Simpson, a Scottish obstetrician. The chloroform anaesthesia quickly became popular in Europe and America but due to its toxic effects, like cardiac arrhythmia and sudden death, it was displaced by ether.

The indigenous population's chewing coca leaves was considered satanic by the Spanish conquerors after 1500 and it was banned. In 1879 the cocaine started to be used for the treatment of morphine addiction. In the same year Vassili von Anrep demonstrated the analgesic properties of the newly discovered alkaloid on live frogs legs at the University of Würzburg. Later Heinrich Quincke used first diagnostic and then therapeutic lumbar puncture. Today, the use of cocaine for medical purposes is withdrawn due to its widely known addictive effect.

In 1895 Bayer began to sell diacetylmorphine, better known as heroine as an excellent analgesic and anti-cough agent. In 1897 aspirin was invented.

By the early 19th century humanity used opium, cannabis, capsaicin, cocaine and aspirin, as thousands of years before. Acupuncture, physical therapies and botany were also used. Surgical anaesthesia, the science of anaesthesia was established. This was the beginning of modern medicine, an enormous development of surgery started and the research on pain gained a new impetus.

The approach of pain in the 20th century

Numerous attempts have been made to define pain. "Pain is an even more terrible master than death." "We all die, but pain deprives us from human dignity even more terribly than death itself. Therefore, I feel over and over again that it is a great honor that I can protect the sufferer from his or her ordeals." *(Albert Schweitzer, 1931)*

Pain was regarded a concomitant of a defensive reflex (Sherrington 1906), or an inevitable sensory response to tissue dam-

age. The radical parting from Descartes's philosophy and a change of approach were represented by Melzack and Wall who created the gate-control theory in 1965, in which the peripheral nociception and the cerebral pain perception are separated.

"An unpleasant sensory and emotional experience, something that only exists in the conscious brain."

According to another interpretation of theirs "pain is a unified experience that originates from the interaction of several components, from discriminative, affective-motivational and conscious components, each of which are mediated and modified by forebrain mechanisms at spinal cord, brainstem and cerebral levels."This means that there is no pain impulse or pain sensation, there is nociception at the periphery, sensing pain is in fact a cortical activity, so it is a psychological phenomenon. Consequently there are no pain receptors either, pain is the complex balance of several activations. Later they developed the neuromatrix theory, which did not give a full explanation to all aspects of pain, e.g. to phantom pain not even according to their own assessment.

In the meantime pain relief became available for a wide range of society since the discovery of paracetamol (1893) and aspirin 1897). The discovery of procain (1904), tetracain (1928) and lidocaine (1943) brought an appropriate alternative against cocaine, the application of which was withdrawn. Lidocaine revolutionized local and regional anaesthesia. Epidural anaesthesia (EDA) has been performed since 1921.

In 1939 meperidine was discovered as an alternative for morphine and heroin. Later numerous narcotic analgesics were marketed, such as fentanyl, alfentanyl, sufentanyl, ketamine, tramadol and nalbuphin which are mainly used in the anaesthesia and methadone, buprenorphine, hydrocodin, oxycodon, which are applied in chronic pain management. A number of intravenous introduction agents and inhaled narcotics, local anaesthetics and nonsteroidal anti-inflammatory painkillers were put on the market.

Acupuncture got into the sphere of Western medicine in a sophisticated way, while modern pharmaceutical manufacturing and technology could reach every region all over the world. Numerous physical treatments, like physiotherapy, behavioural therapy, TENS, magneto therapy have spread. National and international pain societies have developed, including the International Association for the Study of Pain, which has undertaken and fulfilled a leading role. The IASP has been the world's largest multidisciplinary organization that has specifically focused on pain research and treatment since its foundation in 1973. Patient-controlled analgesia (PCA) has been carried out since 1980. In 1985 the first Acute Pain Service was started and specialists' pain surgeries, pain clinics have been established worldwide. The basic principle of the multi-modal approach to pain has been available since 1998. Despite these incredible efforts, pharmacological and technical achievements pain management does not reach all those in need, especially in the developing or modest-income countries. "I have been doing research on the causes of inefficient management of postoperative pain for almost thirty years but all in vain, everything remained the same ... the insufficient or incorrect application of the available information may be the most important explanation." *(J.J. Bonica 1990)*

Nociception and pain

The first encounter with the patient

An acute pain may often be started by a deliberate or accidental tissue injury or the appearance of a disease. Other times we come across pain which is part of a known chronic disease, when the pain may be the usual pain known and accepted by the patient or a completely new, different type of pain. The acute and chronic pain may have already been experienced but they may also be entirely unexpected phenomena. After the first encounter, sensing and performing the initial nursing protocol we can notice the fact that unlike using a blood pressure gauge, an ECG and a pulsoxymeter, we cannot put equipment on the patient to measure the nature and degree of his/her pain.

This information may be important as far as our upcoming decisions are concerned. Knowing the location and extent of the pain may be alarming, e.g. pain in the sternum area, squeezing chest pain may indicate a heart attack but as we know, a heart attack may also occur without pain. The patient sometimes feels pain where the primary damage is, sometimes somewhere else. Sometimes very little damage triggers tremendous pain (e.g. the pinpoint bleeding of the thalamus), sometimes extensive damage is almost pain-free (e.g. large hemispheric haemorrhage). Patients sometimes use various expressions to describe their pain, other times they just mention it as a fact and say that "It hurts". Some of the patients in pain show specific emotional and behavioural patterns, whereas others show no response at all. It can be observed that sometimes the pain disappears, decreases or increases, appears, its location occasionally may vary, consequently pain is not permanent and non-stationary, it is a spatially and time-wise variable phenomenon, so it affects everyday life and mobility. We can also see patients having arrived from other cultures, from different ethnic groups, from various social, religious and societal strata with different threshold for pain, different attitudes, different pain management and other learned behavioural patterns. It can be even more confusing that many times the patient does not indicate any pain in the case of unambiguous tissue damage or obvious bone fracture, so we are uncertain in the injury assessment of body regions which are not so clearly visible.

The anatomical bases of nociception

If our body is subjected to tissue damage or an impact that bears the intensity of a potentially damaging tissue we have an unpleasant experience, which we have kept in our mind since childhood. We have adequate experiences and memories about the usual expectable consequences. We reflexively move away the given part of the body from the harmful impact, this way protecting our body from further damage. The experience is integrated in the neocortex and the limbic system. Between the initial stimulus and the *noxious stimulus* and the apperception of the process there is an extremely complex and interactive process. This subjective complex experience is pain.

Nociception is the peripheral recognition of a potentially tissue damaging stimulus. The noxious stimulus transmits messages towards the higher nervous system structures through the process of nociception. To do this, first of all it must have specialist endings, which are sensitive to these stimuli, which it can recognize and decode. These nerve endings are the nociceptors.

The *sensation of pain is* a cortical process, consequently there are no pain stimuli and pain sensation receptors in the periphery, just as we have no "hands-receptor" for sensing hands, either. The peripheral nerve endings are sensitive to many types of stimuli. We can feel our partner's hand on the back of our neck by one touch we know that it is him/her. During the process the nerve endings of the skin are decoding the stimuli, they send information to the spinal cord and the brain about the mechanical, thermal, pressure and chemical conditions. The information is processed in the brain, it is matched with the memory traces in the limbic system, it becomes conscious that the little rough, soft, bulky, moist warm object is living, it is human and hand-shaped and it is very likely to belong to our partner.

However, the way we take this touch is through the *integrative and modulation activity* of the brain which is manifested via the descending modifying, modulation processes. The momentary appearing *behavioural response* depends on a great many factors, it is multi-modal. It is influenced by the societal and social circumstances, the location, the ambient environment, the temperature, upbringing, religion, the momentary mood, time of day, hunger, thirst or satiety, the underlying health condition or illness, medication, but even unemployment, job conditions, sexual satiety and also the momentary desires. Who would not remember a completely different response to the same touch of the same person?

The cerebral modulation of pain occurs in a similar manner and it appears in the periphery, as in the dorsal horn of the spinal cord, where the primary data processing takes place, and in the neural regions higher than the spinal cord e.g. in the thalamus, where the secondary data processing takes place, and in the cortical-limbic system as well.

Nociception

The nociceptors densely innervate the skin, they can be found in the bones, muscles, joint capsule, internal organs and in the vascular system, particularly in the meninges and the perineurium of the peripheral nerves. They are missing from the parenchyma of the lungs, the visceral pleura, from the pericardium and from the tissues of the brain and spinal cord. The nerve fibres used to be called free nerve endings previously, but nowadays they are known to be very complex anatomical structures. Depending on what type of fibre they are terminal parts of, they can be called *non-myelinated C fibres* and *Aδ fibres with a thin myelin sheath*.

The other classification of nociceptors is based on the type of stimuli they can be activated by. According to the above mentioned activating stimuli they are called *mechano-, thermo- and chemo-nociceptors*. If only one type of stimulus activates the nociceptors, they are called *unimodal*. Both within the *C* and *Aδ nociceptors* there is a significant population, the members of which can be activated by *hot, mechanical and chemical* stimuli as well (e.g. capsaicin, bradykinin, low pH etc.), which are called *polimodal nociceptors*. The grouping of primary afferent neurons in pharmacological terms to be *capsaicin-sensitive* or *capsaicin-insensitive* dates back to almost thirty years. On this basis, the additional feature of polimodal nociceptors is that the pharmacological receptor of the hot substance of peppers, i.e. *capsaicin,* can be found in their membranes (the so-called. TRPV1 receptor, see details later).

The nociceptors normally respond only to strong stimuli but damaged or inflamed tissues produce *chemical substances* with which they sensitize them and therefore they send a pain signal to a weak stimulus as well. Such factors are the *nerve growth factor* (NGF), *bradykinin* (BK), *serotonin* (5-HT), ATP, H+ protons, i.e. the inflammatory acidic conditions, lipid products, the inflammatory soup, elevated temperature due to inflammation and higher pressure originating from tissue tension. All of the pharmacological receptors of these substances and factors are already known.

Therefore, the first step in the process of nociception is to transform the (mechanical, thermal, chemical) stimuli decoded by the nociceptors electrical signals. This process is the *transduction,* which takes place in the nociceptors. The further transport of the electrical impulses towards the spinal cord is the *transmission*. The *Aδ fibres* are responsible for the initial, rapid, sharp pain, while the *C fibres* are responsible for the slowly appearing, persistent, throbbing pain. The primary afferent fibres in the dorsal horn of the spinal cord get switched to the secondary neurons.

The transmission tracts of the spinal cord

Ascension tracts

After having entered the spinal cord the sensory nerve fibres with different functions and sizes are separated and are gathered into nerve fibre bundles or tracts in the white matter. Following the switch, the electric impulses originating from the nociceptors get to higher neural regions through ascension tracts.

Supraspinal system

Thalamus

The thalamus is the pain centre, no matter if it is either the end or the switch location of the sensory and pain information which are on their way to the cortex. It processes almost all sensory information before they get to the cortex.

The periaqueductal grey matter (PAG)

The periaqueductal grey matter (PAG) is located around the cerebral aqueduct. It can be divided into four subunits which lie next to the aqueduct in a longitudinal direction. The integration of several functions (motor, nociceptive and au-

tonomic) takes place here, which may be critical in a survival situation. The functions controlled by PAG can be pain facilitation, analgesia, fear, restlessness, verbal expression, sexual behaviour and cardiovascular control.

Reticular formation

The role of the reticular formation in the process of pain perception is to supply the affective component of pain. The reticular formation participates in the establishment of the complex behavioural reactions, which is the component of the aversive or nocifensive responses, not based on spinal reflexes. The motor, autonomic and sensory functions, by which the brain responds to a nociceptive stimulus, are bound to the reticular formation.

The hypothalamus

The hypothalamus plays a role both in the autonomous and in the neuroendocrine response. The hypothalamus is likely to respond to somatic and visceral tissue damage and pain. Autonomic excitement and emotional responses are partially transmitted by the hypothalamus.

The limbic system

It is a system of complex structure, including several neural structures, which is mainly responsible for the traces of memory and for their storage, imprinting, recollection, the emotional and autonomic responses that emerge when they are recollected, for learning and for the learning and memory patterns. These include the amygdala, nucl. accumbens, hippocampus, the ventral and dorsal tegmental areas, partly the raphe nuclei, and PAG. Pain and development of the associated current emotional state is connected to the limbic system. The diversity of the responses to pain, even in the same individual may be explained by the complexity and spatial extent of the system.

The cerebral cortex

The development of sensing pain occurs in brain, it is the *perception,* the localization of the place of pain in the cerebral cortex. During the thalamocortical mapping of pain, the fibres are directed from the VPL seeds towards the primary sensory centre of the cerebral cortex. The sensory cortex has a somatotopic structure and the higher level, more abundantly innervated areas of the body are represented more dominantly.

In addition to the primary sensory cortex, other areas also get activated for pain as secondary sensory areas. These are such as the corpus cinguli, the insula and the prefrontal cortex. This is a system, scattered at a relatively wider area, which is responsible for the dynamic coding of pain intensity.

According to the accepted theory the "pain neuronal unit" contains three neurons. The first one is the primary sensory neuron, which starts with the nociceptor and ends in the dorsal horn of the spinal cord. The second one is the spinothalamic neuron, which intersects in front of the central canal and connects the dorsal horn with the thalamus. The third one is the thalamocortical neuron, which ends in the pain centre of the cerebral cortex. As we can see, the situation is much more complicated in reality. Pain is the result of stimulatory and inhibitory, branched and converging impulses in a dynamically changing, diversified system.

The descending modulation system

The neuron encounters, the synapses meet the fibres of the descending tracts coming from the brain, which may modify the switch. This process is the *modulation*. In 1965 Melzack and Wall proposed the *gate theory,* the attenuation or facilitating role of the spinal cord, based on the diameter of the active incoming fibres, which could explain how the momentary mood, other activities or massive stimuli arriving from elsewhere may attenuate the pain sensation. Later in 1993, they re evaluated their theory, their model does not explain every type of chronic pain sensation, e.g. phantom pain. Therefore they created the *neuromatrix theory.*

The sympathetic nervous system

The autonomic nervous system is part of the involuntary regulatory process, an integrative part of the adaptive biological system, together with the neuroendocrine and motor responses. Ensuring that the body can function in changed environmental conditions, in hostile or dangerous situations is an important task of the sympathetic nervous system. The developed physiological responses aim at defence, attack and escape and the intensification of the sensory functions necessary for this (seeing, hearing, touching), blood flow increase, the speeding up of heart functions and breathing, the growth of tissue oxygenation. The fast, first, reflex-like processes of nociception are necessary for pain perception, in order to induce an immediate response for the establishment of the defensive behaviour of the body. The further slow, prolonged pain components would impede the body in conducting the appropriate defence or attack reactions, so the pain gets suppressed, blunted. When comforting environmental conditions are established and the danger passes away, the previously repressed pain comes to the fore, drawing attention to the injuries, damages and thus allowing the body to heal and restore the injuries. In the case of chronic pain, due to the persistently present stimulation the sympathetic nervous system is in a constant stimulated state, which is unnecessary for the biological system.

The steady sympathetic tone causes an altered operation of the painful area and the whole body. In the case of an acute injury the contraction of the vessels serves bleeding mitigation and the accelerated circulation creates faster healing. In chronic cases, the contraction of the vessels of the given part of the body causes *oxygenation and nutritional disorders,* the atrophy of the given part of the body and a decrease in its function, which are accompanied by acute pain. This phenomenon is abnormal and called *sympathetic dystrophy.* The sympathetic nervous system, the centre of which is the *hypothalamus,* is of course, connected to each functional central nervous system area, such as the limbic system, the thalamus, the reticular formation and the cerebral cortex. Besides the newer experiences pain, the cortical effects, psychological factors, the memory traces and higher cognitive functions such as reading, speaking and learning are able to induce activation.

The pharmacology of pain

The pharmacology of nociception

The peripheral terminals of sensory neurons are the sensory nerve endings, the nociceptors. The nociceptors may be sensitive to several stimuli, depending on what kind of *pharmacologically determined* receptors can be found on their membranes. These receptors are specific binding places to which a particular substance, a ligand can connect. When it occurs, the receptor is activated and starts a specific pharmacological and physiological response, which can be the conformational change i.e. phosphorylation of an ion channel (Na, Ca, K). Eventually the process starts depolarization and an action potential. Transduction is the first step in the process of pain perception, which can be inhibited by non-steroidal anti-inflammatory drugs (NSAIDs), opioids and local anaesthetics.

The process of transmission is when the stimulus decoded by the nociceptors is transmitted towards the spinal cord in the form of an electrical signal. The conductivity of the thick (Aβ) and thin (Aδ) fibres with myelin sheaths and the thin (C) fibres without a myelin sheath can be blocked with *local anaesthetics* and alf2 agonists. The thinner a fibre is, the smaller concentration local anaesthetics is able to block the nerve, or by using local anaesthetics with the same concentration, the thin non-myelinated fibres can be blocked faster and to a larger extent than the thick fibres with myelin sheaths. It is understandable that on an anesthetized limb the position perception may remain when the fast and slow pain sensation has already gone.

The place of modulation is the dorsal horn of the spinal cord where the primary sensory neurons switch to the secondary sensory neurons. Excitatory neuropeptides (e.g. *glutamate, aspartate* and *substance P*) may help and strengthen the pain signals on the ascending projection tracts. However, endogenous *(opioid, serotonergic and noradrenergic)* descending analgesic systems serve the attenuation of nociceptive responses. The major inhibitory neurotransmitters of the dorsal horn are *glycine, noradrenalin (NA), gamma amino butyric acid (GABA)* and *opioid* peptides.

Therefore the modulation processes of pain can be influenced by local anaesthetics, alpha-2 agonists, opioids, NSAIDs, tricyclic antidepressants (TCADs), selective serotonin reuptake inhibitors (SSRIs), NMDA receptor antagonists, and by substances that affect cannabinoid receptors. There is *a contrary effect to the inhibitory mechanisms,* a fact that the repeatedly incoming stimuli "winds up', makes the given area of the spinal cord more sensitive to further stimuli. This phenomenon (the so-called *"wind up"*) is responsible for the pain that could otherwise be relieved in a short period of time, but is not properly mitigated, to potentially become prolonged. The continuously arriving signals and the activation of the *dormant, "silent" nociceptors* initially sensitize the synaptic connections of the given, then the adjacent spinal segments, and occasionally even that of the remote areas, therefore the pain does not only spread in time but also spatially. Furthermore, with the termination of the basic process it may remain as chronic pain, as a secondary pain phenomenon. Wind-up is the phenomenon of *central sensitization.*

Perception is the cortical response to the nociceptive signals, which is transmitted to the cerebral cortex by third-grade sensor neurons. According to the constructive perception theory the meaning of the stimuli is determined by *cognition,* consciousness (prior experiences, knowledge, expectations, memory etc.), the sensory stimuli are interpreted based on them (Helmholtz). The perception process can be inhibited by general anaesthetics, opioids and alpha-2 agonists.

Long-term potentiation (LTP) is a partial phenomenon of the plasticity of the central nervous system. The simultaneous synchronized stimulation of two cells reinforces the processes of the signal transmitting system (signal transduction), which results in long-term, lasting effects. This effect can be not only pain, long-term memory and higher cognitive operations are built by a similar mechanism. Enhanced reactivity, hyper-sensitivity are typical features of acute and chronic pathological pain. This is the result of the changes in the neural response.

Since the sensation of pain is extremely complex and involves several mechanisms (inflammatory and neuropathic components, acute or chronic processes, potentiation or modulation), a given dose of a medication cannot be expected to be effective in every patient. *The multimodal approach* to analgesia means that knowing the mechanisms described above, pain must be attempted to be mitigated by its process from stimulus to modulation through perception, considering also its dynamics and its occurrence in time. Pharmacological interventions may be administered on seven levels, which are

1. *the peripheral nociceptor,*
2. *the dorsal root ganglion,*
3. *multisynaptic system of the dorsal horn,*
4. *the brainstem modulation system,*
5. *the antinociceptive system,*
6. *the multisynaptic system and*
7. *the cortical processing and localization system,*

which is also responsible for the descension (inhibitory) control. In this treatment strategy there are numerous traditional and modern, pharmacological and non-pharmacological,

physical and psychological options available. However, for selecting the right way and combination, it is essential to check the type and degree of the pain we are facing.

The classification of pain

Pain can be classified in a number of ways, from a neuropsychological point of view, on the basis of its occurrence in time and according to the etiology and the anatomical regions involved.

Neurophysiological classification

Somatogenic pain can basically be divided into nociceptive pain, or non-nociceptive pain on the basis of the pain mechanism. Generally they constitute pain which are somatogenic (organic), i.e. they start from the body tissues (skin, bones, muscles, connective tissue, blood vessels, internal organs, ...), so clearly on the basis of anatomical, pathophysiological mechanisms. Somatogenic pain may be *nociceptive or neuropathic.*

Pain is considered *nociceptive pain* when the body is subjected to a harmful stimulus and the appearing pain is manifested in the increased activation of the nerve fibres which are sensitive to somatic or visceral, nociceptive stimuli. The harmful influence is a nociceptor activation, which may be initiated by external stimuli (mechanical injury, heat or chemical damage) or internal stimuli (ischemia, hypoxia, inflammation, bleeding, spatial occupation, the tension of a glenoid organ). When somatic nerve fibres are involved, the pain is typically a sharp pain or a pressing type of pain, which is typical of many types of tumour pain. The majority of pain is nociceptive pain.

Neuropathic pain is the result of the pathological functioning of the nervous system. It is not nociceptive pain. It is assumed to be the disruption, aberrant reaction of the pathological somatosensory processes of the central, or the peripheral nervous system, or both. Pain may involve the efferent (descending) functions of the sympathetic nervous system, *(sympathetic pain syndrome)*, or an identifiable peripheral pathological process e.g. nerve compression, the development of a neuroma or a central nervous system pathological process such as stroke or a spinal cord injury. Usually pain is part of a well-defined nervous system disorder. The pathomechanisms of neuropathy may include the redistribution of the Na-channels, over expression, accumulation and peripheral sensitization, central sensitization, alpha-receptor expression, increased transmission, reduced inhibition, the spontaneous discharge of the dorsal root ganglia (DRG) and spontaneous activity increase of the C-fibres.

Psychogenic pain occurs when the pathophysiological processes of the body are not enough to explain the developed pain or the degree of prostration, or they are clearly based on psychogenic factors (psychogenic pain syndrome). Pain should not be classified psychogenic without properly supported evidence. If there is no unambiguously detectable underlying psychological pathogenic process regarding pain, then the process must be classified as *idiopathic*. The cause of pain of unknown origin is still mostly somatic pain, for the exclusion of which all the differential diagnostic evidence must be available. Of course psychogenic pain is not to be confused with a *psychogenic reaction* to pain, which is the psychological component of pain.

The *psychogenic pain syndrome* is characterized by constant occupation with the symptoms, worrying and the patient typically rejects psychological cause and effect correlations.

The most common pain include: pain in the back, low back pain, intercostal muscle pain, pelvic pain, headache, joint pain, muscle pain, jaw pain, facial pains.

Classification according to time

Acute pain is a normal, predictable physiological response to chemical, thermal or mechanical stimuli or it is associated with surgery, trauma and acute diseases. In general it is time-limited and dynamic. *Acute pain* is a biological signal, which is fundamentally necessary for survival, it indicates the strength and duration of exposure but it usually lasts for a short time, ranging from a few minutes to several days but it is generally maintained for less than one month. It is often accompanied by anxiety, excitement, tension, which originate from the hyperactivity of the sympathetic nervous system. They can be observed by the changes in various physiological parameters e.g. tachycardia, hypertension, increased respiratory rate, dilated pupils, perspiration.

Chronic pain is a painful condition that goes beyond and is maintained for longer than a usual acute illness, or a reasonable recovery period, i.e. the pain lasts longer than 3-6 months. It affects 20-30% of the population worldwide.

Chronic pain may be inherent to a chronic pathological process that causes continuous pain or evokes recurrent pain in the course of months or years. *Chronic pain* is generally defined on the basis of the duration of pain. It is maintained or recurrent pain also after wound healing that lasts longer than 3 months, even in cases when it is foreseeable from the severity of the injury that the tissular damage will persist for several months, or it will worsen.

Temporary pain

It is a form of acute pain which involves the activation of nociceptors. The affecting stimulus is potential or predictable, accidental or deliberate, it causes tissue damage, the extent of which may or may not be predicted or it does not cause any tissue damage at all. These include pain originating from accidental injuries or medical, health, beauty care interventions. Therefore it is also called incidental or procedural pain. It does not require medical interventions or it is usually the result of them. In everyday life, theoretically it plays an adaptive, protective role but the normal responses to pain must often be consciously oppressed. Among other factors, this depends on upbringing, intellect, age, gender, psychological background, the underlying disease and the painful condition.

Aetiological classification

The eliciting cause of pain may also vary. A significant part of nociceptive pain is the consequence of a trauma, they are called *traumatic pain. Inflammatory pain*, which in most cases originates from an infection, is also common. Circulatory disorders are associated with *ischaemic, hypoxic pain,* their occurrence is a typical feature of heart attacks and lower limbs with vasoconstriction. Pain can be caused by *tumorous diseases* but it can also develop as a *result of the treatment.* After surgeries there is post-operative surgical pain. Degenerative chronic diseases are accompanied by prolonged pain of the joints and bones. The bleeding of body cavities, the perforation and inflammation of hollow organs are a combination of ischaemic and inflammatory pain in most cases. The functional disorders of the nervous system structures cause *neuropathic pain.* Psychogenic pain describes the pain where there is no evidence of a physical or anatomical reason for the pain.

Anatomical classification

It is a self-explanatory classification, which include headaches, the pain of the brain and facial skull, neck, pain of the spine in the neck, back and groin areas, pain in the limbs, chest and abdominal pain. Naturally, their aetiology and timings are different, the division only applies to the anatomical location.

Pain and pain-related psychological phenomena

Pain is both a biological and psychological phenomenon at the same time. The cortical influences and cognitive functions change the process of nociception and chronic pain and these have an effect on the psyche, the mood and on the experience and acceptance of pain. By definition, pain is an unpleasant sensory and emotional experience, according to this pain depends on the *attention, mood* and *previous experiences* of the individual and on numerous more *environmental factors* that are all in interaction with one another. The distracting, *intensive cognitive* functions may fully extinguish pain perception.

The psychological components of pain

Attitude, mentality, faith or *belief,* and the *assessment of the situation* may have a rather big impact on the individual, on the way the person perceives and treats pain. The pain may persist long after the damage itself has healed. There is often chronic pain requiring intervention without any pathological evidence, whereas sometimes the patient accepts his or her disease as an unchangeable symptom or simply handles it for the continuation of an activity, which is important for himself / herself or for the environment. Upon the occurrence of pain the individual may apply a number of *behavioural patterns* to overcome pain, to make it more tolerable, to deflect attention. These behavioural patterns are called *coping,* which in English means both a concealment and coping. A *positive attitude* helps acceptance, a *negative attitude* magnifies even a hardly existing pain.

Anxiety and fear occur in almost every case of pain. *Suffering* applies to physical pain but often to mental or emotional pain or to any very unpleasant feeling, emotion or sensation. Suffering is typical of living creatures that are able to sense in different ways, often dramatically displayed. Suffering can be *physical* or *mental,* it may be mild or intolerable. The individuals' opinion, concerning whether pain can be avoided or it is unavoidable, useful or useless, deserved or unjust, significantly influences the attitude to suffering. *Religiousness, intellect* and *interpretation, hope* and *hopelessness* are also major contributors to the development of attitude about pain. Further psychological phenomena are the *crisis response* and *stress,* which may occur in cases of both acute and chronic pain. If the process is prolonged we may encounter with *depression, longing for death* and *suicidal inclinations.* The personality differences make the above mentioned psychological factors and the ability to cope with pain different.

The circumstantial components of pain

Many people experience *social, financial* and productivity losses in the course of their chronic disease. This has a very big impact on *family life* and one's *role at home.* The *respect* at home often does not change from the part of the family members but the patients' interpretation of the situation is that they can no longer meet the expectations of their former roles, they need substitution, so by the loss of their activity they are no longer entitled to respect in its earlier form. *Culture* and the *ethnic background* and the *religious factors* mentioned above may increase or attenuate these phenomena. Dropping out of work is not only a financial loss but also a loss of *social prestige,* which is accompanied by an even sharper loss of role. The loss of *social life* and *social and partner relationships* is a situation, which is can be accepted with great difficulties. This is exacerbated by the feeling of the *inability to take care of oneself and needing help* with the most basic activities like eating and hygiene. Upon *avoiding the disadvantages of the disease,* patients may *conceal* their symptoms and complaints, they may dissimulate to maintain their role at home while being afraid of losing their job and income. In the fear of punishment the same may apply to a criminal injured during a robbery or to a student having done a mischief. *Searching for disease benefits* is another manifestation of *intentions*

and goals. Obtain the attention and care at home, escaping from the conflicts at work, absence from a court trial may enlarge the pain. Simulation implies that the patient does not have any problems but s/he acts as if s/he had some. In these cases, however, the subconscious and the psychological components do not attenuate the existing pain signals, the modulational inhibition decreases, the patient's pain really gets amplified.

The pain-related pathophysiological and pharmacological phenomena

Addiction

Addiction is a neurobehavioural syndrome with genetic and environmental influences, which manifests itself in psychological dependence on substances that evoke a psychological effect and despite its harmful effects it can be characterized by uncontrolled use. Addiction can also be expressed as "psychological dependency." Physical dependence and tolerance are normal consequences of long-term opioid analgesia and it cannot be called addiction.

Physical dependency

Physical dependency is a special neuro-adaptive physiological state to a controlled substance, which is characterized by a state of medical emergency caused by a withdrawal syndrome, if the application of the administered medicine is suddenly stopped or reduced or if an antagonist of the medicine is admeasured. Physical dependency is an expected result of opioid use. Physical dependency is not the same as addiction.

Pseudo addiction

It is the medicine and drug-seeking behavioural pattern in the patients who receive inadequate pain management. They see physician after physician until they receive analgesics in an appropriate dose. This attitude may wrongly be interpreted as addiction.

Active substance (medicine or drug) abuse

It is the use of any substance for non-therapeutic purposes or the use of a medicine for any purpose that differs from the original purpose of the prescription.

Tolerance

Tolerance is a physiological state, a pharmacological phenomenon induced by the regular use of a medicine, in which the dosage of the medicine or active substance must be increased to induce the same effect or a reduced effect is observed with the same dosage. In the course of an opioid treatment tolerance may be obvious or not obvious but it should not be mixed up with addiction.

The physiological effects of pain

Acute pain

Acute pain has *adaptive, protective functions,* and due to this it is "useful" pain. It does not burden the recovery mechanisms of the body, its duration is short-term or it will presumably be short. However, it induces adverse physiological, pathophysiological mechanisms.

The sensory nerves, the effector functions of the primary afferents are responsible for the *local reactions* caused by acute pain. Similarly to an inflammatory reaction vasodilatation and red response appear at the damaged area and its immediate proximity, due to the axon reflex the inflammation broadens beyond the damaged area and then the area becomes swollen based on the triple response of Lewis. As a result of the inflammatory phenomena peripheral sensitization appears, due to the reduced threshold for stimulation of the nociceptors hyperaesthesia, primary and secondary hyperalgaesia occur and in case of a long-term occurrence, neurogenic inflammation appears.

Acute pain induces *generalized reactions* as well, which causes *arousal* with an immediate reflexive preventive phenomenon and behaviour. This acute response protects the body from further damage. The activation of the sympathetic nervous system prepares the patient for the attack, escape and defence. A *stress reaction* begins with motoric activity. The sympathetic-adrenergic response is also associated with increased blood pressure, increased heart rate, respiratory rate, respiratory volume increases, vasoconstriction (increased peripheral resistance TPR), oxygen demand and the centralization of circulation. Therefore, the blood flow decreases at the periphery, the areas that are unnecessary for the defensive and offensive behaviour are provided with less blood, hypoxia, acidosis develops.

During the *activation of the renin-angiotensin system* salt and water retention, venous congestion occur, due to the increased load the cardiac filling volume increases, the risk of pulmonary congestion and deep vein thrombosis is increased.

In acute pain *tension, fear* and consequential *shortage of sleep* occur. This increases stress, which leads to peripheral and central sensitization, to "wind-up" and to long-term potentiation, causing the stimulation of the pain process and the reduction of the modulation processes of pain. Due to the local wound sensitivity *immobilization* develops with decreased respiratory function, consequential hypoxia, the air content decreases at the lower areas of the lung (dystelectasis) or disappears (atelectasis). The risk of *pneumonia* and *pulmonary embolism* is significantly increased.

The *body's defence mechanisms* are further reduced by the neuro-endocrine changes, the increased level of cortisol, the occurrence of hyperglycaemia and catabolism, and immunosuppression occurs, which increases the risk of infection and impairs the wound healing process.

Acute pain plays a role in *learning,* in long-term memory and inculcation. Without a doubt, facts, events and experiences associated with pain can be remembered even as long as we live.

Chronic pain

The essence of chronic pain is the so-called central sensitization, in the course of which pain is amplified by the spinal cord mechanisms and it remains long-lasting, regardless of whether there is nociceptive exposure, inflammation or trauma or there is not.

Chronic pain has *no adaptive or protective role,* it is *not "useful"* pain from a physiological point of view. Chronic pain has lost its biological significance, it does not protect, safeguard the body, it does not aid wound healing, it does not have any beneficial effects. However, in the course of its occurrence it causes a lot of discomfort to the patient, especially by the effects of the autonomic nervous system, which either do not become conscious or get conscious only partially (sleeping disorders, dullness, concentration or attention deficit, chronic stress, loss of appetite, loss of taste, lacking joy, tension, decreased libido, constipation). These complications often develop gradually, they are also accompanied by depression in many cases. In addition to the continual stress responses it induces the body to permanently compensate, it is long-term, or may last for months or for years. It may cause low mood, insomnia, learning and behavioural disorders. The patient may get further away from or drop out of his/her social environment, problems may occur in the patient's work, social and sexual relationships, which may lead to newer consequential problems. The long-term medication becomes a way of life and we must consider the side-effects of long-term medicine (liver and kidney disorders, stomach and intestinal mucosal erosions, bleeding, perforation). According to some authors more people die due to the complications caused by non-steroidal anti-inflammatory drugs than in malignant diseases. That is why a psychiatric approach, behaviour therapy, occupational therapy, physiotherapy and alternative medicine may get a significant role in chronic pain management.

Cancer pain

In physiological terms, cancer pain is *continuous acute pain,* which depletes the body's reserves and which is accompanied by the expressed responses and potential complications of acute pain. Cancer patients are understandably more susceptible to infections, deep vein thrombosis, the instability of the fluid and electrolyte balance, fatigue, increased catabolism and chronic peripheral oxygen deficit, which make the basic process even worse. Using simple analgesics in the treatment of severe pain does not make much sense, the patients require rapid and effective pain relief. The pain intensity is not proportional to the tissue damage type or extent but it helps to use a pain scale to determine the most reasonable rational prescription for a patient. All of the classic pain categories can be applied for cancer pain, the acute and chronic, the nociceptive and neuropathic, the somatic and visceral. The *incidence of cancer pain is very high, its development is multifactorial.* The WHO concluded that despite its pain management recommendations, analgesia is inadequate in some of the cancer patients. It urged the expanded intervention approach as the fourth step of the analgesic ladder for acceptable pain management and the alleviation of symptoms. In the mission carried out to relieve pain, interventional pain management can be an indispensable ally among the circle of patients who suffer from pain that cannot be eliminated by anything else. .

The components of cancer pain

Acute pain

This is the pain originating from the *damage caused by tumours* e.g. bleeding, tumour disintegration, the tumour breaking into vessel or nerve formula, into body cavities. These constitute the usual nociceptive somatic and visceral pain. Treatment-related pain may occur as acute pain caused by cancer therapy, chemotherapy, radiotherapy and surgery. An important aspect of pain can be the *simultaneous appearance of pain originating from other diseases* (such as appendicitis, disc herniation, deep vein thrombosis, pulmonary embolism, pathological or normal fractures)! Therefore, the staff treating and nursing the patient must be aware of the patient's pain and its development and every new type of pain should be examined.

Chronic pain

A possible component of chronic pain is nerve pain as a result of the compression caused by the tumour, which may appear in the form of neuropathy, neuralgia and neuritis. The next most common pain is bone pain, which develops due to the space occupation by bone metastases or pathological fractures. Ischaemic pain develops due to blood supply disorder, the pain of the soft body parts comes about as a result of invasive tumour growth or the disintegration, haemorrhage of the tumour. After a surgical intervention postoperative pain appears, subsequent to breast and limb removal phantom pain often occurs. A significant proportion of pain is reference pain and dominant pain often suppresses the more moderate pain of the other regions. After a successful intervention treatment, some of the patients either immediately or within a short time show up with the pain of another body region. Consequently tumour pain is a mixed pain, it is acute in its nature, which takes place chronically, usually it lasts longer than 3 months and shows progression. It is therefore understandable that the doses of narcotic analgesics must be increased for two reasons, one of them being the tolerance which inevitably develops in the course of applying opioids and the other one is due to the progression of pain.

Pain assessment and measurement

The description of pain

There are a great many terms in use to describe pain. Basically, the patients and the caring staff use two sets of expressions and words. On one hand they are meant to assess the *development and the duration* of the pain (e.g. slowly, gradually, quietly, persistently, continuously and rapidly, shortly, abruptly, stormily, from one minute to the next), on the other hand, they intend to serve *pain intensity* assessment (barely noticeable, mild, moderate, serious, severe, strong, very strong, unbearable). Today, we apply the terms used by the *Abbreviated McGill Pain Questionnaire (R-MPQ)* for the *quality description of the pain* and for the efficiency control of pain relief (sharp, ripping, stabbing, aching, throbbing, dull, pressing, squeezing, piercing, stabbing, hot, sensitive, exhaustive , unbearable).

The patient who is unable to verbalize pain may be in pain as well. *There is nociception and often also pain perception in unconscious or anaesthetized patients as well.* Therefore, the nursing staff must look for clinical symptoms and signs referring to pain and rational pain management must be started in case of an unambiguous trauma (e.g. unconscious patient with a head injury, polytraumatized patients) and an internistic disease (e.g. unconscious cancer patient)!

Signs, symptoms referring to pain

Pain behaviour

We can encounter pain suggestive behaviour in suffering patients regardless of them being able or unable to communicate. The position of the body is revealing (crouching, to protect a painful part of the body), just as escaping, too much motion or a defensive posture, a forced posture, immobilization. The facial expressions reveal a lot without words, crying, tearing, sighing reinforce to the nursing staff that the patient may be in pain. Patients who are able to communicate complain, ask for medication, take pain killers, use protective equipments and demand nursing and medical help.

Physiological indicators

The autonomic reactions, rapid pulse, increased blood pressure, perspiration, pallor and flushing, increased respiratory rate, enhanced respiratory volume, possibly Se-cortisol from a laboratory specimen, increased catecholamine levels indicate the presence of pain.

The organ systems involved in pain

One of the fundamental methods for the classification of pain is the location of pain. The perceived location of pain can be determined from an anatomical aspect, according to the exact anatomical regions and most often the patient also begins his/her complaint by indicating the location of the pain.

Based on these, the highlighted regions also from a differential diagnostic point of view are as follows.

- A *headache,* which can be *primary* (e.g. migraine, cluster, tension-type headache) or *secondary* (e.g. brain tumour, increased intracranial pressure, haemorrhage, meningitis, metabolic disorders, hypoglycaemia, liver failure, uraemia or trauma, brain contusion, fracture).
- *Face and neck pain* (e.g. toothache, temporal arteritis, trigeminal neuralgia, sore throat, ear inflammation, lymphadenitis, parotitis, epiglottitis, trauma).
- *Chest pain* (e.g. acute coronary syndrome, pulmonary embolism, pleuritis, oesophagitis, erosions, gastroesophagealis reflux, thoracic tumours, trauma)
- *Abdominal pain,* gastrointestinal system, liver and gallbladder, pancreas, urinary excretion and drainage apparatus, sexual organ system, the *anatomical* lesions of the retroperitoneum (perforation, blood supply disorder, tumour...), the *inflammatory, metabolic* changes (e.g. ketoacidosis, porphyria), and *traumatic* lesions.
- *Back pain and low back pain* are degenerative diseases of the spine (e.g. disc herniation, spondylolysis, lysthesis), inflammation of the spinal column and its surrounding area (e.g. epidural abscess, paravertebral abscess), the so-called myofascicular pain of the paravertebral muscles, trauma.
- *Arthritic pain* can be the pain of one joint or several joints due to degenerative, inflammatory, metabolic or traumatic reasons.
- *Pain in the limbs,* the anatomical lesions of the extremities (e.g. blood supply disorders, innervation disturbances, bone, joint, muscle lesions and tumours), their inflammatory lesions (e.g. periostitis, myositis), degenerative diseases (e.g. humeral epicondylitis) and traumatic lesions.

Pain appearing in a particular anatomical region does not necessarily mean that the cause of the pain should be explored in the given organ system. The causes of headaches and abdominal pain can often be found in metabolic disorders and radiating or projected pain appear at another part of the body e.g. what causes pain in the left shoulder girdle, elbow and finger is the gallbladder, pneumonia, that causes pain in the right shoulder girdle and in the back frequently appears as abdominal pain in case of children.

Common associated phenomena

Acute pain is often complicated by stress, increased sympathetic tone, renin-angiotensin system activation, which may cause breakaway tension, fluid retention, arrhythmia, manifest circulatory deficiency, peripheral arterial circulatory disorder and decreased cerebrovascular flow in patients suffering from cardiovascular diseases.

Chronic pain is often accompanied by low mood, decreased concentration, inattention, learning disorders, anorexia or increased appetite, depression, societal, social and sexual disorders. Limb or body part protective motion may strain the contralateral limb or joints, it may cause pain in other parts of the body, e.g. in the spine.

Transient, procedural pain is often accompanied by *collapse,* vagus overweight, bradycardia or stress, sympathetic-adrenergic increase of tone.

Cancer pain is a continuous constant acute type of pain, consequently it can cause all the complications characteristic of both acute and chronic pain. Due to the frequent *nausea and vomiting, acid-base and fluid-electrolyte disturbances,* oesophageal erosions may occur. As a result of the compromised immune system there are frequent *infectious diseases,* due to *paraneoplasic* syndromes the frequency of *deep vein thrombosis and pulmonary embolism* incidence is higher. As a result of the underlying disease or the treatment behaviour and borderline *personality disorders* develop. For these reasons, the optimal treatment of cancer pain does not only mean the elimination, mitigation or optimal control of pain but it involves that cooperation among the representatives of almost every medical profession is needed.

Diagnostic procedures

History

After having taken the general nursing history it is practical to take the *history concerning* their pain. It is worth asking the following questions: "Have you ever been in similar pain before? Did the medicines used at the time help you or did they worsen the complaints? Do you know about any allergic or unexpected reactions to analgesics, local anaesthetics?" Then gathering data on the development and the nature of the present is recommended to be collected.

Anatomical localization: *"Where does it hurt?"* The beginning of the pain: *"How long has it hurt? How long does the pain last?"* The cause of pain: *"Why does it hurt? Did anything happen that triggered the pain?"* The degree of pain: "*How much does it hurt?"* The nature, quality of the pain: *"How does it hurt?"* Are there any *provoking or mitigating factors?* Does anything reduce or increase the pain? Does a *change in position* improve or worsen the pain? Do bending over, lying down, standing up improve or worsen the pain? Is the pain related to *breathing and motion?* Is the pain related to *diet* or fluid consumption? Is the pain related to the *evacuation of urine or faeces? In which direction does the pain radiate?* In addition to pain, h*as any other symptom or phenomena appeared* such as fever, nausea, vomiting, perspiration, blood in the stool or urine?

Physical examinations

Arising from its definition, pain is a *subjective perception,* there is no physical examination that could prove the presence or absence of pain. Naturally physical examinations are necessary to determine the location and the extent of an injury, anatomic abnormality, inflammation, limitation in mobility etc., which may indicate the possible existence and intensity of pain as well. In the course of the examination viewing, palpation, auscultation, percussion are essential along with examining the patient's own and passive movements, the comparative examination, the examination of the nervous system, reflexes, autonomic, sensory and motoric functioning, abnormal reflexes, pressure, hot and cold, nociceptive pain sensations, the comparative examination of allodynia and hyperalgesia, the pressure of nerve exit points (e.g. trigeminal neuralgia test), the specific pain provocation tests of the spine and the joints (e.g. Lasegue, lumbosacral, sacroiliac Mennel) but basic ear, nose, throat or a digital rectal examination can be equally important in a given case.

Laboratory tests

Laboratory tests cannot show either the degree or the nature of pain but they may indicate the underlying disease, e.g. inflammation (e.g. WBC, CRP, PCT), intracranial inflammation (liquor glucose, WBC, S-100 protein), urinary tract inflammation (e.g. WBC, protein, blood, pus), abdominal cavity inflammation (e.g. AST, ALT, γGT, LDH, amylase, lipase, SeCa, circulatory disorders (such as D-dimer), the presence of tumour (e.g. CEA), diabetic angiopathy or neuropathy, (e.g. VC, Hb1Ac), alcoholic neuropathy (e.g. SeBi, PTI/INR, APTT), kidney disease (e.g. creatinine, CN, SeK).

Imaging Tests

It has been impossible to support or rule out the presence and the extent of pain by any imaging method up until now. Imaging tests like ultrasound, X-ray, CT and MRI show the anatomical basis, the location and size of the abnormalities but they do not provide any objective information about the patient's pain. *Conclusions can be drawn about the existence and intensity of pain based on the information on the underlying disease. Today, functional MRI* (fMRI) allows us to depict the *development and change of pain* (e.g. pain relief with medications, acupuncture, magnetic therapy, images before and after TENS). Unfortunately, in everyday practice it is not applicable and it does not show the given patient's pain level despite its costliness.

Other examinations

Supplementary diagnostic tests e.g. laparoscopy, bronchoscopy, pleuroscopy, oesophago-gastro-duodenoscopy, rectoscopy, colonoscopy, F.O.G. fiberoscopy etc. give further details on the basic disease but none of them is informative as far as pain is concerned.

The objectivization and estimation of pain

Most commonly rating scales are used for the estimation of pain. These measuring scales measure the values shown or told by the patients, so it requires the patients' communication. The most commonly used types are the category measuring scales (e.g. no pain, mild, moderate, severe, unbearable pain), the Visual Analogue Scale, i.e. VAS (e.g. a 10-cm line with two end points is a simple and sensitive examination method), which is widely used, it makes the patient's subjective pain objective, so it constitutes an integral part in the documentation of specialized medical areas (e.g. anaesthesiology, intensive care, oncology, medical pain consultation). Using this value, the effectiveness of analgesics and analgesic techniques are followed up on.

Further one-dimensional scale which measures pain intensity is the *numerical scale (NRS, Numerical Rating Scale),* which indicates pain intensity on a scale from 0 to 10; the *Coloured Analogue Scale (CAS),* which is similar to VAS, but it indicates pain intensity by colour codes (e.g. red is for severe pain, orange is for moderate pain, green is for no pain); the facial scale (FAS, Facial Analogue Scale), in which pain intensity is indicated by faces (e.g. Wong Baker Scale), and the Verbal Description Scales (VDS), where pain intensity is reflected by different adjectives.

Other than the intensity of pain, its qualities, the wording of its quality are also evaluated. The multi-dimensional scales measure pain in multiple dimensions, e.g. localization, type, depth. McGill's pain questionnaire is often applied and among patients with dementia the PAINAID scale is used, which assesses the impact of pain on e.g. the facial expressions, physical movements, interpersonal relationships and mental states. In addition to the assessment of pain intensity and quality, the *effect* of pain on the body and on general *health* can also be measured. Other, less commonly used pain rating scales are the Pain Index, the Roland-Morris Disability Index and the Pain Disability Index.

In the course of their work, the nursing staff should be aware of the fact that the well-known rating scales such as VAS and the Numerical Scale are not suitable for the measurement of *neuropathic pain*. The first widely used scale for measuring neuropathic pain was the Leeds Assessment of Neuropathic Symptoms and Signs Pain Scale (LANSS).

Degree of pain are difficult in premature babies, newborn babies and infants. For the assessment of pain in newborn babies, premature babies and infants the Face, Legs, Activity, Cry, Consolability (FLACC) scale can also be is used, which examines young children in five categories listed in the name of the scale.

Diagnostic measuring devices

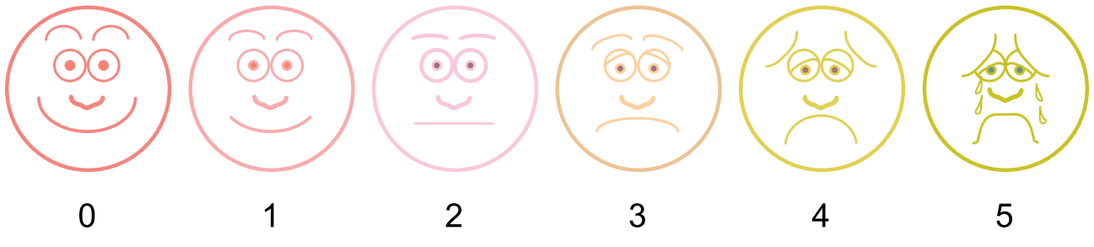
Diagnostic measuring devices may also be applied in pain assessment and estimation. These are the von Frey filaments, which are also used in diagnosing polyneuropathy, but algometers are suitable devices as well, which are generally used for measuring the mechanical pain threshold, e.g. the Wagner algometer types or sonic algometers.

The nurse's role in pain assessment

In the course of the nursing work it should be treated as a fact that acute pain is a physiological response to chemical, thermal or mechanical stimuli, its duration is limited. Chronic pain is a condition which is constant, its intensity may vary. It may last for months or years. It shows the subjectivity of pain that patients suffering from the same disease, undergoing nearly identical processes give account of pain with varying intensity.

During the assessment the following issues must be assessed:

- the factors that triggered the patient's pain (motion, evacuation, diet, anxiety)
- pain determinants (age, anxiety, earlier experiences i.e. pain experiences, cultural background, accompanying diseases, exhaustion)
- the beginning of pain (if there were any introductory symptoms, if the patient has experienced periodicity in his/her chronic pain)
- the nature of pain (stabbing, cramping, burning, aching, shooting, throbbing, tensive, dull, devastating)



Picture 1. Wong-Baker Scale

- type of pain (visceral surface)
- the appearance of pain (the patient can show the location of the pain with one finger and knows if it is diffuse, radiating, or localized in one organ)
- symptoms accompanying pain (sweating, grimaces, nausea, vomiting, anxiety, behavioural manifestations e.g. crying, cursing, yelling, withdrawal)
- duration of pain
- the effect of pain on social relationships and sleep quality
- degree of pain (using objective pain assessment scales)
- the patient's view of non-pharmacological pain-relieving procedures

When rating scales are applied, the nursing staff must be aware of their assessments, the frequency of their application and the documentation requirement.

The treatment of pain

Pain is best to be treated according to its *intensity, size and progression*. There are transient, banal pains, which either do not require any treatment or they need a quite simple treatment. The majority of the acute pain, obtained at home fall into this category. The acute pain which exhausts the body requires a treatment in all cases. The World Health Organization (WHO) and the International Association for the Study of Pain (IASP) have explicitly declared that *efficient pain relief is a fundamental human right.* Consequently even narcotic analgesia cannot be denied from a patient for whom other medicines have not proved to be sufficiently effective or the patient is not allowed to take them for other reasons. The view, which is widespread at certain places, that narcotic analgesics are not to be administered to patients with skull injuries or polytraumatized patients before an accurate diagnosis is made, must be reassessed. Today's modern imaging diagnostic background is not based on the patient's verbal or non-verbally communicable complaints. It permits the patient's powerful pain relief, sedation, anaesthesia and instrumental ventilation, which includes the effective use of opioid analgesics.

Every patient suffering from pain must receive *effective pain* relief, preferably *with no delay* if possible, including consultations with medical specialists who are professionally responsible and competent in analgesic techniques. In these consultations all the professions that involve having gained experience in their own field in the care of patients suffering from pain must be represented. These fields include anaesthesia, intensive care, traumatology, orthopaedics, rheumatology, musculoskeletal rehabilitation, oncology, neurology, interventional radiology, clinical psychology and alternative medicine.

The protocols in the area of analgesia help to decrease suffering a great deal no matter if they refer to pain assessment, pain estimation or measuring the efficiency of pain relief, or carrying out the necessary therapeutic steps for treatment. Patients with acute pain can be assessed faster, the quality and degree of their pain can be assessed more objectively, doctors see them more quickly, they receive effective analgesics sooner. In case of patients suffering from chronic pain the protocols help in the accurate assessment of disability, physical and mental impairments and the disadvantages of life situations, which are also made objective by the protocols that involve effective assistance as well.

The patients' level of *acceptance improves, the functions do not get worse,* the ways of effective pain relief (medicinal, physical, psychological or alternative) can be found faster, they are easier to combine, the effectiveness of pain relief can be measured more accurately and more consistently. In cases of post-operative pain, the efficiency of perioperative assessment and treatment clearly increases, the likely reduction of post-operative pain, it decreases the need for long term hyperalgesia, functionality improves more rapidly and complications are reduced.

The protocols do not only involve the proper order of procedure but the time interval, the deadline, in some cases, the notification of co-professionals and pain consultants are also included (e.g. after getting to the hospital ward from the operating theatre, or after the patient's arrival at the hospital, or 20-30 minutes after the injections had been given). Therefore, due to the strict guidelines, it is almost mandatory for the patients to go through the procedures described in the protocol guidelines and by this the nursing or medical subjectivity that refers to the assessment and to the actions can be eliminated. One of *the most widely used protocol* system, which imposes constraints but also allows freedom is the pain ladder of the *WHO* which concerns the analgesia of tumour patients. With its introduction the analgesia of tumour patients has improved on one hand and the shortcomings of inadequate pain relief have been revealed on the other hand. Due to this, the WHO protocol has been modified according to the needs and technological opportunities, by the introduction of the Fourth Step (interventional pain relief). The coordination of the national and local professional protocols that have spread in the various institutions, hospitals and care units, their efficiency assessment, scientific evaluation and modifications according to the needs is still the task of the future.

Non-pharmacological analgesia

The nurses are close to the patient throughout the day and this can be used for the application of non-medical pain-relieving procedures. Performing non-pharmacological pain-relieving procedures may decrease the demand for pharmacological analgesia. A continuing further training and self-education are indispensable.

Positioning

Prop up, rest positioning, bleeding mitigation, pressure, wound management and fixation are part of first aid. Injured limbs, wound edges, broken bones in a rest position are much less painful. Pulsating, throbbing pain can be significantly reduced by supporting the damaged part of the body. Bruises on the head, swellings on the face may be pressed by cool objects of a relatively large weight and haemorrhages and pain may be reduced with this method. Soft tissue bleeding stops after 5-7 minutes of pressure of the, so the development of further haematomas can also be prevented.

Cold therapy

The fastest relief of pain, muscle and connective tissue haemorrhages after acute dull injuries is by administering an ice pack. In the course of providing first aid caring for distortion, luxation and contusion are done by cooling, arranging a resting position and by raising the given limb. Cooling reduces pain, helps to heal fatigue injuries and decreases inflammation when applied in the first 72 hours after injury. Cold or ice must not be placed directly on the skin so would advise wrapping in a towel.

Cryotherapy is a more sophisticated and much more expensive medical utilization of cold, which works on temperatures moderately or deeply below the freezing-point. It is suitable for the treatment of symptoms, relieving pain, neurogenic pain management and the mitigation of myofascicular pain and pain of connective tissue origin. It is also applicable for curative and palliative treatment in order to reduce the size of tumours and for the treatment of solid tumours, especially marginal lung tumours and solitary kidney and bone processes.

Heat therapy

Heat is known to decrease muscle spasms, it relaxes the joints and relieves certain types of pain. Its utilization is very widespread, although sufficient training and experience are required for its proper application. Dry heat and infrared light can worsen pain of inflammatory origin, the disease may revive, wound healing is decreased.

Heat batteries used to be water-filled sacs but nowadays they are silicone gel-filled plastic bags with a textured surface, which can be heated in a microwave oven or water bath. Its ancestor is the warm salty bag or bean bag used in folk medicine. Paraffin baths are not widespread for home use, it is a procedure applied in physiotherapy. The painful limb is generally dipped in paraffin heated to 49°C and then heat is conserved by a rolled-up cloth. It is suitable for the treatment of small joints and smaller parts of the body. A reliable heating pot and an accurate thermometer are required for its application, which is time consuming and requires careful cleaning. Moist heat, hot water, thermal spa treatment, mud packs increase the blood flow, relax the joints and muscle stiffness and relieves pain. It is strongly recommended in case of chronic and degenerative pain but it should be avoided in case of tumorous diseases.

Hydrotherapy

Hydrotherapy is the combination of swimming, water exercises, floating in the water, activity therapy, relaxation and heat treatment. It can be used in the treatments of chronic pain, degenerative bone and joint diseases and in cases of rheumatic, neuralgic and tumorous pain. It improves mood and decreases the feeling of helplessness. One of its methods is the Hubbard-bath therapy, in which treatments can be carried out in circulating water with water temperature of 35.5 to 37.5°C or 37.5 to 40°C. It effectively relaxes the muscles, spasms, cramps get dissolved and the blood flow increases. Its efficiency can be increased by exercises done in water. Another form of hydrotherapy is the popular thermal spa bath, in which the salts and various compounds of elements of varying quality and quantity (sulphur, calcium, phosphor, iron and other elements) or even radioactive isotopes (e.g. in Hévíz, Hungary) can be found. In these thermal spas in addition to water and heat, active ingredients aid the healing process, which get to the joints and muscles through the skin.

Massage

Massage has many forms, medical, therapeutic massage is meant here. Moderate massage causes substantial blood flow, it decreases muscle spasms, relieves tension, reduces pain, improves mood, it improves the motion of frozen joints. A thorough physical palpation of the body allows the therapist to have direct contact, so that the body parts that have caused complaints can be directly checked before, during and after the treatment and changes, muscle knots of other parts of the body can be detected. It is applicable in almost every painful condition, its beneficial pain relieving effect is explained by the gate theory and also by the matrix theory. Under the influence of experienced hands endorphins are released in the spinal cord and the brain similarly to the TENS treatment. In case of chronic diseases it can be an activity, group therapy and relaxation treatment as well. In cases of acute inflammations, pregnancy, advanced tumorous diseases the involved part of the body should not be massaged at all, the massage of other body parts should be carefully considered.

Surface treatments

Surface treatments include balms, creams, ointments, oils, gels, solutions, adhesive plasters, drops and other products which can be placed on the surface of the skin. They are mostly products that can be purchased without a prescription, which contain active ingredients of vegetal, animal, or synthetic origin in a variety of quality and quantity. The most effective analgesics contain capsaicin, snake venom extracts, local anaesthetics, herbal extracts and non-steroidal anti-inflammatory substances. They can be used for the treatment of acute and chronic pain in the limbs, joints, waist and back and for pain caused by minor injuries, strains, distortions and inflammatory processes.

Physiotherapy

It is a part of physical therapy, it is a movement therapy and medical gymnastics carried out without physical, i.e. electrical and pharmacological supplementary devices, the purpose of which is to alleviate locomotoric complaints, to decrease pain that has developed due to various reasons, to strengthen muscles, to increase the circle of joint motions and to dissolve contractions. Physical therapy treatments also include positioning in rest positions, which may be applied in case of the inflammation of joints. Other physical therapy treatments are conducted by the use of electrical devices or occasionally medicines and local anaesthetics. The main effect of the low-frequency electric treatments is analgesia. If galvanic current is used, the descending galvanic treatment is most commonly applied, with the help of which medicines can be ingested into the body, which is called iontophoresis. During a diadynamic current treatment two types of current is applied at the same time, it is based on the galvanic current, on which different diadynamic currents are superimposed. The biological effects of low frequency stimulation currents are primarily determined by the frequency of the applied stimulation current and secondarily by the time of each impulse. The main goal of the symptomatic treatment is relieving pain. A new utilization of stimuli currents is the combination treatment in which simultaneously with the electrical stimuli currents other physical therapy treatments are applied e.g. iontophoresis, ultrasound treatment, sonophoresis, thermotherapeutic interventions, hydrotherapy or negative pressure using vacuum electrodes. Pain relief can be achieved by electrical stimulation. Although the mechanism of action generated by impulse current is not known precisely, based on the positive results several stimuli currents have been developed, e.g. the stimuli currents introduced by Träubert and Bernard's diadynamic currents. The common feature of high frequency treatments is that they have no specific effect, so the energy absorbed in the tissues is converted into heat. Short waves, microwaves and ultrasound belong to this category. Shortwave diathermia is when the electromagnetic field heats the surrounding tissues by using capacitor discs. Previously it used to be applied for the treatment of back, low back, kidney area problems, urinary tract infections, acute and chronic sinusitis. Its popularity was decreased by its insufficient level of effectiveness. Its application should be avoided in cases of malignant diseases, peripheral vascular illnesses, sensation failures, implanted metal devices (prostheses, pacemakers). Microwave diathermia is simpler and easier to apply, it warms the muscles evenly, the lower lying areas get well heated even without heating the skin, since the high water content tissues absorb the microwaves selectively. Ultrasound reaches the deep tissues by high-frequency sound waves. It can be used on the basis of special indications. Its risk is its tissue destructional impact.

Alternative medicine

Acupuncture

Acupuncture is an ancient Chinese treatment method that is used not only in relieving pain but also in the treatment of other health damages and in the preservation of health. There is no doubt that the patients' attitudes affect the success of acupuncture. There are a lot more successful pain relieving treatments among those patients who expect a positive effect. It is a further object of research to examine the biological and physiological explanation of the efficacy of acupuncture. There are numerous theories for the explanation of not only the traditional Chinese qi (energy) flow points and meridians but also of the bio-mechanisms of acupuncture, e.g. endorphin release, the brainstem opioid system activation but these theories still need to be proved. Acupuncture is considered a safe procedure, its correct application practically causes very few complications. When acupuncture is applied, certain points of the body are stimulated, mostly with the help of thin needles punctured into the skin and thereby the vital energy (qi) flow is regulated. Its most common application and partly proved effectiveness is in the treatment of lower back and back pain, osteoarthritis, knee and joint pain, neck pain, myofascial pain, pain caused by muscle strain and fixed joints and menstrual pain, whereas there are controversial but encouraging data supporting the use of acupuncture in relieving fibromyalgia, temporomandibular, obstetric pain, shoulder, elbow, wrist pain, headaches and pain caused by migraines.

TENS

TENS (trancutan electric nerve stimulation) is a non-invasive, safe nerve stimulation, the purpose of which is to mitigate acute and chronic pain. Despite the controversies, numerous studies and meta-analysis have proved its effectiveness in relieving postoperative pain, pain in osteoarthritis and chronic musculoskeletal pain. It is applicable for obstetric analgesia and for cosmetic purposes. The low and high frequency TENS exerts its effect through the activation of the opioid system. It decreases the excitatory neurotransmitter (glutamate) emissions that operate in the spinal cord and higher central nervous system areas, it modulates the nociceptive signal and enhances the release of the inhibitory neurotransmitting substances (γ-amino butyric acid, GABA). Its peripheral and central antinociceptive effect is reached by the temporary blockage of the pain gates. The low-frequency TENS induces the release of serotonin and activates the serotonin receptors in the spinal cord and causes γ-amino butyric acid release. Generally portable battery-operated equipments are used with two or more gel, silicone or carbon rubber electrodes. The waveform and frequency can be changed. The treatment, which operates with low (1-5 Hz), higher (8-15 Hz) or high (80-160 Hz) frequency, usually takes 20-30 minutes. It can be conventional (C-TENS) or acupuncture-like (AL-TENS). It plays a role in acute, chronic

and palliative pain management. It has an effect of enabling patient to save on medicine, so it is especially beneficial in case of elderly patients with multiple concomitant diseases, when non-steroid anti-inflammatory drugs (NSAIDs) and opioids can be used only with caution. Many patients report beneficial effects, while others do not, due to the individual differences and differences in the pain threshold. Its prolonged or too frequent use may cause local tissue damage, so it is practical to vary the location of the electrodes and limit the treatment to a 20-minute duration applied once or twice a day.

Magnetic treatment - magnetotherapy

According to the theory of magnetic treatments the magnetic field promotes the healing processes by energy transmission. There are static magnetic treatments, when the patient lies on a magnetic mattress, bed or in a magnetic ring and there are pulsing, active magnetic treatments when a magnetic field with variable strength and frequency is created by a generator. In between these two there are the magnetic body jewellery, earrings, bracelets, necklaces and belts, which are static magnets but due to their constant movement they impulsively affect certain parts of the body. Magnetotherapy effectively reduces back and low back pain, fibromyalgia, joint pain, connective tissue and scar pain and it has a beneficial effect after bone fractures, in post-operative pain, especially after the insertion of metal implants, the assimilation of which it also helps. It can be applied for the treatment of the involved body part or the whole body. The latter general therapeutic approach is aimed at restoring the body's functions. It stimulates circulation, it inhibits the adhesion of the cellular components of blood, improves liver and kidney functions, decreases the pain caused by sports injuries, muscle fatigue and muscle soreness, increases the endorphin level, influences the pain modulation processes, stimulates the immune system, promotes relaxation, mitigates stress and improves sleep. The proved effects of pulsing magnetic therapy are vasodilatation, analgesia, anti-inflammatory effect, spasmolytic activity, increased tendency to healing and anti-oedema effect. Magnetotherapy is controversial, especially due to inappropriate applications, doctors' orders or devices of questionable efficiency.

Music therapy

Music comforts, relaxes, decreases stress and pain, it has a positive effect on mood and on emotional states. It alleviates stress, makes breathing rhythmic and even. It energizes and relaxes the muscles. In some music therapy non-musical sounds are listened to, in other cases so-called healing music is combined with relaxation exercises. Later, the patient automatically does the exercises while listening to the given music.

Colour therapy

Different colours can raise one's mood and reduce depression.

Aromatherapy, homeopathy and bio-resonance

Aromatherapy is a therapy that considers the human body as a whole. Many fragrances are used, which are applied dry, vaporized, massaged into the skin or mixed with bath water. Its analgesic effect is doubtful, but it has a relaxing effect, alleviates exhaustion, elevates mood and reduces stress. Medical evidence has not yet been established on the beneficial analgesic effect of aromatherapy, homeopathy and bio-resonance treatments.

Ayurveda

Ayurveda, which is rooted in Indian culture, provides a general approach to overall health. The treatment consists of a healthy diet, a change of lifestyle, herbal treatments, supplements, physical activity, exercises, yoga, massage and other healing modalities.

Biofeedback

Biofeedback uses special devices, which help patients to learn about the physical reactions to know what happens in the case of pain and stress. Biofeedback helps to learn how the body behaves if it is tense or relaxed. On this basis the relaxation exercises can be acquired. The physical phenomena learnt in the pain-free periods may be recalled and in case of pain a reverse process can be started. In the case of pain relaxing the neck, the body, the muscles of the limbs, reaching physical and spiritual peace the physical reactions are such as in pain-free periods and pain relief can be achieved by this, by the elimination of the physical reactions caused by pain. The biofeedback technique controls the responses given to pain.

Chiropractic

The chiropractic practitioners specifically use the "hand-on the patient" technique. Their main activity involves the treatment of pain in the back, low back, bones and joints, joint manipulations, relocations and the reduction of pain caused by connective tissue processes.

Meditation

Meditation is a completely natural therapy, it can be applied in every type of disease and pain modality, in acute, chronic and tumorous pain as well. In meditation patients relax their muscles, direct their thoughts to other planes, focusing their consciousness on acceptance and coping with the pain, their autonomic nervous system is calmed down and controlled. Meditation facilitates the modulation of pain and starts peripheral and central antinociceptive processes. Self-control can be learnt and may also be used in case of problems of psychological origin. Relaxation techniques help in case of exhaustion and fatigue, when the responses to nociceptive stimuli may get significantly increased. However, their application is more beneficial in prevention, in the establishment of harmonic mental health. Meditation reduces stress, improves depression, sleep problems, decreases arthritic and fibromyalgic pain, it helps in the acceptance and coping mechanism of tumorous pain. In the course of self-hypnosis and hypnosis therapy a path opens and communication takes place with the subconscious self, positive contextual information and suggestions reach the mind, which are, in many cases, able to decrease or cease the pain to an unimaginable extent. This may explain the sometimes very roughly tissue damaging demonstrations of fakirs, which are free of painful reactions.

Pharmacological therapy, the pharmacology of pain management

The opioid receptor agonists – narcotic analgesics

The group of agonists, which affect the opioid receptors, is the most significant in the mitigation of moderate and severe pain, an outstanding representative of which is morphine, which has historical and pharmacological significance. It is a narcotic analgesic, which is used in the largest proportion even today. *Morphine* is an agonist affecting the artificial opioid receptors (MOP), it is an analgesic and causes other side effects. The side effects include respiratory depression, decreasing the motility of the gastrointestinal system, constipation, nausea, vomiting, sedative effect, confusion, dizziness and euphoria. Its usage is characterized by tolerance development, i.e. higher doses are needed to achieve the same effect, physical dependence and addiction.

The opioid agonists can be classified from different points of view. *Natural opioids* are phenanthrene skeletal compounds of morphine and codeine, papaverine is a benzylisoquinoline derivative (smooth muscle anti-spasmodic, analgesic effect is missing). The *semi-synthetic compounds* are the hydroxylated (codeine), ester (heroin) or oxidized (hydromorphone) derivatives of morphine. Oxymorphone, oxycodone and naloxone are the precursors of thebaine. The synthetic opioid compounds can be divided into four groups, the morphine derivatives (levorphanol), the diphenylurea or methadone derivatives (methadone, propoxyphene), the benzomorphan derivatives (phenazocine, pentazocine) and the phenylpiperidine derivatives (meperidine, fentanyl, minor fentanyl, sufentanyl, and remifentanyl). Opioids can be *pure agonists* (e.g. morphine, fentanyl, sufentanyl) and they can be *partial agonists* (e.g. nalbuphin, butorphanol and buprenorphine). They can be used for relieving acute pain (morphine, meperidine, fentanyl), for surgical anaesthesia (fentanyl, minor fentanyl, sufentanyl, remifentanyl), and for the alleviation of chronic tumorous pain (morphine, fentanyl, buprenorphine, oxycodone, hydrocodone). They may be applied in tablets, intramuscularly, intravenously, epidurally, intrathecally, in adhesive transdermal plasters and even in a lollipop form. They can be combined with other analgesics, mostly with paracetamol or nonsteroidal anti-inflammatories, they can be used with local anaesthetics for close-to-spinal anaesthesia or for plexus blockades.

Non-steroidal anti-inflammatories

Cyclooxygenase enzyme (COX1, COX2) is required for the formation of prostaglandins, which decreases the stimulus threshold of the afferent nerve endings (nociceptors) in inflammatory processes. This way the inhibition of prostaglandin synthesis directly reduces the inflammatory hyperalgesia and allodynia, as well as the white blood cell reaction, which is responsible for the production of inflammatory mediators. The non steroidal anti-inflammatory drugs (NSAIDs) prevent the formation of prostaglandins in the spinal cord dorsal horn, where it plays a pain evoking modulator role. Therefore the NSAIDs have an effect both peripherally and centrally. NSAIDs have several side effects that are significantly different from the side effects caused by opioid analgesics. The most significant side effects include the stomach mucosa damaging effect, the ulcer causing effect, the kidney damaging effect, the chronic obstructive pulmonary disease (COPD) aggravating effect, the asthma attacks causing effect and the subcutaneous tissue damaging effect.

The NSAIDs can be divided into several groups: the *salicylates* (aspirin, acetylsalicylate), indole *acetic acid* (indomethacin), *pyrrole acetic acid* (diclofenac), *propionic acid* (ibuprofen) and *benzothiazine derivatives* (piroxicam). The recently discovered *selective COX2 inhibitors* (celecoxib, rofecoxib, valdecoxib) have an analgesic effect and are free of a significant part of the harmful side effects. The *para-aminophenol derivative* acetaminophen and paracetamol are centrally acting analgesic and antipyretic with negligible anti-inflammatory effect, which decreases the formation of prostaglandins by a yet unknown mechanism, therefore didactically it cannot be listed as one of the other anti-inflammatory painkillers. The NSAIDs can be applied in numerous forms and they constitute the most widely used pharmacological products.

Local anaesthetics

On the terminal organ of the afferent sensory neuron, on the nociceptors, the peripheral mechanical, chemical or thermal stimulus is transcribed, which gets transmitted as an electrical signal on the axon towards the dorsal root ganglion (DRG) and the spinal cord dorsal horn. The transmission of the electrical impulses can be prevented by blocking the Na+ channels. The suitable agents for this purpose are the local anaesthetics, which cause the reversible blockade of the conductivity of the nerves. The Na-channels can be in a dormant, inactivated or an open form, to which the local anaesthetics may connect to in varying degrees, in other words, the binding of the local anaesthetics may be modified by the membrane potential. This is the modulated receptor hypothesis. The transmission of the vegetative, sensory and motoric fibres is interrupted by the continuous increase of the concentration of the local anaesthetics, whereas the full operation returns when this effect passes away.

Cocaine was the first local anaesthetic used as a medicine, which is not used in the legal practice of medicine due to its abusive potential. *Lidocaine* caused a much faster, more intensive and longer lasting effect than procaine, which is derived from cocaine. It is also suitable for surface mucosal anaesthesia and it is also effective in the treatment of cardiac arrhythmia. Therefore, lidocaine is the standard agent, which the other local anaesthetics are compared to. Their classification according to the chemical structure: they can be *ester-bound* (cocaine, procaine, chlorprocaine, tetracaine) and *amide-bound* (lidocaine, etidocaine, prilocaine, mepivacaine, bupivacaine, levobupivacaine, ropivacaine). On the basis of their effect duration they can be *short-acting* (procaine, chlorprocaine, lidocaine, prilocaine) and *long-acting* (tetracaine, mepivacaine, bupivacaine, levobupivacaine, ropivacaine). Their systemic toxic effect depends on the amount of the local anaesthetic absorbed by the body. In order to decrease the absorption rate vasoconstrictor agents (e.g. adrenaline) can be used, which at the same time also prolong the effect of local anaesthetics. However, at the supply area of end arteries (e.g. fingers, penis) vasoconstriction may cause blood supply disorders, that is why the application of vasoconstrictors for local anaesthesia is not recommended at these areas.

As side effects, local anaesthetics may cause local tissue irritation, vasoconstriction or vasodilation, and after the effect ceases temporary neurological deficits may occur. They worsen the stimulus conduction of the heart muscles, they have an antiarrhythmic effect and they weaken the power of cardiac contractility. They evoke severe excitatory symptoms in the central nervous system, such as excitedness, tremor, tinnitus, muscle twitching, seizures. Higher concentrations cause nervous system depression with respiratory arrest. Allergies to local anaesthetics are rather rare and they almost exclusively occur with ester-type drugs. The added adrenaline is responsible for the unpleasant symptoms, which are most often the reddening of the skin and rapid heart rate, whereas the reason for the feeling of fainting is the psychological attunement to temporary pain.

Adjuvant substances

Antidepressants

The drugs originally developed to treat depression are favoured to be used in chronic pain management. The antidepressant drugs increase the noradrenaline and serotonine activity of the descending modulational system, they block the Na channels and by this antinociceptive effects are triggered. While they have a beneficial effect on one type of pain, they do not have any effects on other types of pain, e.g. diabetic neuropathy and postherpetic neuralgia respond well to antidepressants, whereas they have almost no effect on low back and back pain.

Tricyclic antidepressants (amitriptyline, nortriptyline, imipramine) are not selective, they also inhibit the re-uptake of noradrenaline and serotonin, consequently their analgesic effect is stronger than that of the selective noradrenaline reuptake inhibitors (desipramine, maprotiline). The *selective serotonine reuptake inhibitors* (SSRIs), paroxetine, fluoxetine and citalopram are the least effective painkillers.

Anticonvulsive agents

There are numerous agents used for decreasing the spasms of the central nervous system, for the treatment of arrhythmia and for relieving some chronic pain syndromes. These active agents decrease the excitability of cells and the spontaneous discharge of the dorsal root ganglia. The most used drugs in the clinical practice are carbamazepine, lamotrigine, gabapentine and pregabalin.

The NMDA (N-methyl-d-aspartate) receptor antagonists

The NMDA receptors play a critical role in starting and maintaining central sensitization. Currently there is extensive research being done on the NMDA receptors. The antagonists affecting receptors are ketamine and the opioid cough suppressant, dextrometorphan. A small dose of ketamine is an analgesic, in higher doses it causes dissociative anaesthesia, which is characterized by confusion, nightmares accompanied by psychomotor liveliness. Dextrometorphan is an analgesic only in larger doses but this dosage causes dizziness, fatigue, confusion and psychomimetic effects (false ideas and hallucinations, mimicking psychosis). In animal models several NMDA receptor antagonists have proved to have antinociceptive effects but with significant dose-limiting side effects. In addition to the above mentioned ones, NMDA receptor antagonists also include phencyclidine, the opioid methadone and ketobemidone, memantine and amantadine, which are used in the treatment of Alzheimer's and Parkinson's disease, and nitrous oxide, which is applied in anaesthesia.

Adrenergic agonists

Antinociceptive effect can be achieved by the stimulation of the α2-adrenergic receptors in the spinal cord dorsal horn. The α2-adrenergic receptor agonist clonidine may have analgesic properties, therefore it can also be used as a painkiller in acute and chronic pain. It is applicable systemically, epidurally intrathecally and as a surface treatment. Its general usage is restricted by its strong hypotensive effect.

Serotonin receptor agonists

In case of many, but not all migraine patients good analgesic effect may be achieved by the agonists affecting serotonin receptors, the most widely used representative of which is sumatriptan. The tryptamine-based drugs, the triptans, have a selective effect on the 5-HT1B and 5-HT1D subgroups of serotonin receptors, they cause vasoconstriction against vasodilation, which is considered one of the major pathophysiological reasons of migraine. They decrease the peripheral sensory activation, the nociceptive transmission in the trigeminal brainstem nuclei. Due to their vasoconstrictor effects they can be dangerous in patients with coronary diseases. The triptans may reduce pain and other migraine symptoms during an acute attack, so they can replace the earlier used ergotamine. They can be applied in the form of tablets, subcutaneous injections and nasal spray. The recently marketed agents are: rizatriptan, naratriptan, zolmitriptan, eletriptan, almotriptan, frovatriptan and the experimental avitriptan.

*Bisphosphonate*s are the most efficient antiresorptive medicines that have been known so far. All bisphosphonates increase bone density to a certain extent. Lodronat and alendronate decrease hypercalcaemia and bone absorption caused by malignant diseases and their treatments. They alleviate sympathetic pain syndromes and reduce the frequency of pathological fractures. Bisphosphonates are also suitable for the treatment of corticosteroid-induced osteoporosis.

The application forms of analgesic drugs

See details on the application forms of medicines in the chapter titled "Pharmacology".

Peroral analgesia

This is a procedure applicable in the early postoperative phase of surgery, it is generally not applicable in intensive therapy. However, it is important in the pain management of ambulatory surgery (minor operations) and respectively in the later period of major surgeries when the conditions for oral medication are given and the degree of pain indicates their use.

Suppository

This is an unpopular treatment method in Hungary. It is often used in infants but it is also a practical method for preemptive analgesic administration immediately before surgery.

Transdermal pain relief

Often used such products are: nitroglycerine, oestradiol, fentanyl, testosterone, nicotine. This method with current medications is not suitable for the treatment of postoperative pain.

Intramuscular injection

Common treatment but tests have shown that this is a very labour consuming, less effective procedure, which is painful for the patient and can be dangerous due to its delayed absorption. In the case of hypovolaemia and shock its absorption is uncertain, and in coagulopathy it is contraindicated.

Intravenous analgesia

This is an efficient, safe procedure but the accurately titrated initial (saturating) dose is important just as the maintenance dosage is, which is adapted to the patient's needs. Maintenance dosage with a PCA pump is a preferred practice.

Some forms of regional analgesia

Epidural pain relief with long-lasting cannula: it can be performed with local anaesthetics, opioids, and with the combination of these. In connection with local anaesthetics attention must be paid to the consequences of motoric blockade and autonomic blockade (decrease in blood pressure); in relation to the application of opioids breathing has to be paid extra attention to. Due to its beneficial effects generally this method is applied for the treatment of postoperative pain nowadays in case of surgeries which are accompanied by intense pain.

Long-lasting anaesthesia of the plexus and peripheral nerves: it can be made continuous with the help of a cannula. The procedure is safe, it ensures a pain-free state and good rehabilitation conditions and it may also have special benefits due to the perfusion of the affected region.

Intra-articular analgesia: it is mainly applied in case of knee surgeries (local anaesthesia and respectively morphine treatment).

Patient controlled analgesia (PCA): it is safe for the treatment of postoperative, childbirth, traumatic and cancer pain. The essence of PCA is that with the help of microprocessor-controlled infusion pump patients administer the painkiller dosage to themselves by pressing a button. The drug administration may also be carried out intravenously or epidurally.

Analgesia during surgery

Regional anaesthesia

The purpose of *regional anaesthesia (RA)* is the *peripheral blockage* of the pain causing stimulus and excitation that arrive at the central nervous system from the periphery. The pain causing excitation causes perception when it gets to the brain. Even if it does not become conscious, this sensation of pain stimulates the entire central nervous system, it steers the autonomic balance towards a sympathetic direction and by this, it results in a generalized stress reaction. Knowing the laws of its development, this reaction can be mitigated by general anaesthesia (GA), which can conceal its symptoms that it will not safeguard. Regional anaesthesia means partial anaesthesia of a certain area of the body, which is achieved by administering local anaesthetics in the everyday practice. RA is applicable for blocking the nerves responsible for the head, neck, shoulders, upper and lower extremities and the nerves that segmentally innervate the trunk.

The mucosal *topical anaesthesia* is the anaesthesia of an upper layer of the mucosa.

Infiltration anaesthesia is local anaesthesia, the infiltration of the tissue layers of a given smaller or larger area of the body by local anaesthetics.

The *tumescent technique* is injection infiltration of a larger area of the body layer by layer by diluted anaesthetic solution with a long needle or cannula, with increased pressure

and amount of solution, during which the layers are opened in front of the directed cannula or needle by the applied liquid.

Conduction anaesthesia is the infiltration of usually a small area, innervated by afferent nerves, proximal to the surgical intervention site with some local anaesthetic solution. *Nerve blockade* is anaesthesia that has been developed by an anaesthetic injection administered near a given nerve at the total area of innervation close to a nerve, at the given region of the body, where the injection had been administered. *The blockade of a plexus* causes the anaesthesia of an anatomical region. Theoretically a nerve plexus *can be injected from several points* e.g. the *brachial plexus* can be blocked in the interscalenic, supraclavicular, infraclavicular and in the axillary region as well, naturally with a more and more distal effect. The arm plexus is usually injected from the front but it can also be accessed from the dorsal part of the neck.

The essence of *intravenous regional anaesthesia* is that the blood is pressed out of the venous system of a particular limb with the help of a strong rubber bandage, then it is filled up with a local anaesthetics, at the same time it is prevented from reaching the systemic circulation.

Paravertebral blockade can also be performed in the cervical, thoracic and lumbar sections, in which cases the needle is directed beyond the level of the transverse process, close to the exit roots, whereas the anaesthesia administered to the spinal small joints is called *"facet joint"* blockade. The latter is more applicable for long-term analgesia. *Anaesthesia near the spine* are called *coaxial blockade,* which may be *subarachnoid* i.e. intrathecal, commonly known as *spinal anaesthesia,* or *epidural* anaesthesia administered to the space around the dural sac. In case of major surgeries performed below the waist, spinal anaesthesia is administered, whereas in case of thoracic and abdominal surgeries EDAs with segmental effects are carried out. Spinal anaesthesia causes sensory and motoric blockade distally from the injection, while an EDA triggers a belt-like anaesthesia in the adequate sections of the spinal cord cranially and distally from the injection height.

The occurrence of regional anaesthesia depends on the *applied technique,* the *specialist doctor* administering the anaesthesia, the used *drugs,* their quantity and concentration, the injection site and on the *size of the nerve* to be blocked. In general, an *autonomic, sensory and motoric blockade* is established, which temporarily suspends these functions at the region of the effect. It has the advantage of r*etained consciousness, less intraoperative bleeding,* physiologically *optimal pain relief,* the metabolic and endocrine response is smaller, *decreased thromboembolic complications,* its disadvantage is that a relatively extensive experience is required for its application, it takes longer for its effect to set in than in case of GA and nerve damage and systemic toxicity may occur. Almost all types of regional anaesthesia can be performed with a cannula and perfusor dosage pump, in a continuous or patient-controlled manner. EDA and the plexus blockades are most commonly applied but it is nowadays possible to perform lumbar subarachnoid cannulation as well.

The result accuracy and success of regional anaesthesia can be refined by the application of a *nerve stimulator* and *ultrasound,* the latter for which an electrical stimulator, insulated puncture needles, ultrasound reflex needles are available. The ultrasound targeting can be aided by *navigational systems* and a software specially designed to *detect the position of the needlepoint.* The two methods can be freely combined. Further *imaging techniques* may help in selecting the appropriate anaesthesia methods and techniques. In case of a plexus blockade an orientation ultrasound examination helps in the *mapping* and the selection of the technique and puncture point. An *X-ray examination* may provide a clue for mapping epidurals, it may reveal anatomical differences, variations. In case of more complex anatomical differences (e.g. tumours) a *CT* or *MRI* examination is recommended, in rare cases regional anaesthesia can be carried out with *CT* or *MRI* control.

General anaesthesia

The purpose of *general anaesthesia* (GA) is the *brainstem level blockage* of the pain-causing stimuli and excitations arriving at the central nervous system from the periphery, relieving the patient's pain, creating an unconscious, sleeping state, achieving muscle relaxation if necessary, ensuring free airways, maintaining the stability of the life functions, handling the co-morbidities in the perioperative period and monitoring, controlling and treating the newly emerging physiological, pathophysiological changes. The trio of modern GA is *hypnosis, analgesia and muscle relaxation.* GA may mitigate the stress reaction generated by the nociceptive stimuli coming from the periphery, it may conceal its symptoms but will not prevent it.

Anaesthesia may be carried out by volatile induction and maintenance of anaesthesia (VIMA). *Inhalation anaesthesia* is maintained by inhaling volatile anaesthetics, while *intravenous anaesthesia* is general anaesthesia performed by intravenous induction and maintenance agents. They represent a light and a deep type of *anaesthetic sedation* under controlled conditions, a procedure with total patient guarding monitoring, as it is usual in general anaesthesia, during which a surgical narcotic state is not reached, the patient is partly unconscious but can be woken up to a smaller or larger stimulus, which makes a certain extent of co-operation with the patient also possible.

In the course of total intravenous anaesthesia *(TIVA)* there is continuous intravenous drug administration, a form of which is *target control infusion (TCI),* when a calculated blood or tissue drug level is reached. *Conversion* refers to switching from one anaesthesia type to another one, there is *sequential anaesthesia* when in order to reduce medicational pressure, e.g. when intravenous induction is followed by conversion to inhalation anaesthesia from propofol perfusion anaesthesia, or when the completion of a surgery is performed with a continuous intravenous medicine administration.

Co-induction refers to the joint application of several drugs, which are separately lower doses but together they constitute a more efficient narcosis induction. According to the methods for ensuring free airways, it can be with a *mask,* a laryngeal mask *(LMA),* an *endotracheal (ET)* intubation. As for the method of intubation is concerned, the following types can be distinguished: *endotracheal (ET), intrabronchial (IB),* nasotracheal *(NT),* orotracheal *(OT)* and respectively, tracheostomal *(TS),* which can be conventional or standard surgical *(SST)* or one with percutaneous dilatation *(PTD)* technique.

General features: the occurrence, depth and duration of general anaesthesia depend on the applied technique, the specialist physician who performs the anaesthesia, the drugs used and their amount and concentration. It may begin with *intravenous* or *inhalation induction.* In case of intravenous administration co-induction is carried out by making use of the pharmacological properties and the timing of the agents, with several agents but each one in smaller dosages. After induction upon the beginning of deep anaesthesia, ensuring free airways takes place, which is done with a *face mask or laryngeal mask* in exceptional cases, in short, low-risk surgical procedures, in ASA I and II patients, BMI under 35 and in case of an empty stomach, otherwise it is performed by *endotracheal intubation.* The right size, type and quality are important in the selection of the ET tube. Considering the patient, the largest possible tube size that can be placed in the trachea without complications is to be chosen. In case of a common area with a surgeon, a spiral tube or preformed nasotracheal or orotracheal tube should be selected. It is practical to use a tube made from thermoplastic materials and is provided with a low-pressure cuff. A cuff pressure manometer is recommended for measuring the cuff pressure. In order to facilitate intubation and *achieve* surgical *muscle relaxation* neuromuscular blockade is used, which can be done with the help of muscle relaxants with a *short depolarizing* effect or with *non-depolarizing* muscle relaxants with a short and *intramedia* effect. Ensuring free airways is followed by the *maintenance of narcosis,* which is achieved by using inhalation agents or intravenous drugs. The inhalation agents include *gas and volatile anaesthetics.* The maintenance of anaesthesia is carried out until the end of the surgery, its depth must be regulated depending on the pain and the surgical stimuli (balanced anaesthesia). At the end of the operation, in the course of waking the patient up, the administration of the used intravenous and inhalation drugs is suspended, depending on the muscle relaxation, the antagonization of the neuromuscular blockade is performed, if necessary. Then, when sufficient muscle strength and breathing work achieved and the cardiovascular and respiratory parameters are optimal, extubation may be carried out. During extubation careful and thorough oral and pharyngeal cleaning is performed and then the tube is preferably removed, in the absence of contraindications, with closed exhalation valve by applying 20 to 30 H2O cm overpressure. Patients need careful monitoring in the wake-up period, even if they still have remaining, intact protective reflexes. If possible, this occurs in the operating room or in a directly adjacent room designed for awakening after surgery, where it is possible to maintain patient monitoring, to ensure free airways and to detect and provide care for any anaesthesiological complications.

The drugs of premedication and anaesthesia induction

Anxiolytics, sedatives belonging to the group of *benzodiazepines:* midazolam, clonazepam, alprazolam, brotizolam, buspirone (e.g. in case of myasthenia gravis). *Analgesics:* fentanyl, sufentanyl, minor fentanyl, remifentanyl, morphine, nalbuphine, tramadol, ketamine, diclofenac, paracetamol, clonidine. *Gases:* N2O, oxygen. *Volatile anaesthetics:* isoflurane, enflurane, sevoflurane, desflurane. *Intravenous induction agents:* thipental, propofol, etomidate, ketamine. *Neuromuscular blockers:* ultra short depolarizer: succinylcholine, short-acting non-depolarizer: mivacurium, intermediate-acting: atracurium, vecuronium, rocuronium, cisatracurium, long-acting: pipecuronium, doxacurium. *Anticholinesterases:* neostigmine, physostigmine. *Anticholinergics and sympathomimetics:* atropine, adrenaline, noradrenaline, dopamine, isoproterenol, dobutamine, ephedrine, phenylephrine. *BDZN antagonists:* flumazenil, *opioid antagonist,* partial agonist: nalbuphine, *specific* NMB *antagonist:* sugammadex.

Efficient postoperative analgesia is a *human and medical* point of view but it is also accompanied by economic benefits such as shorter hospital stays, less drug use. *Numerous factors* influence successful analgesia, which is today an integral part of modern surgical care. Postoperative analgesia does not only decrease the patients' suffering but it improves the *morbidity* and *mortality* indicators, it helps recovery.

Pain is a *personal* experience that the patient is usually able to *communicate* with the care provided by nurses and doctors. It is not yet certain that what the patient mediates fully covers the central nervous system, autonomic, mental and psychological changes. The correct communication management often constitutes a very difficult task for the staff in the cases of *unconscious, elderly, patients with mental health issues or learning disabilities, children* or patients struggling with just simple *language difficulties.* Generally hospital surgeons performing surgeries and the anaesthetists and intensive care units together with the nursing staff working with them are responsible for postoperative analgesia. Postoperative analgesia is a *strategy* that lasts *from the pre-operative preparation of patients until discharging them home,* although sometimes it seems that it is only a short-term tactics of the postoperative period. Unfortunately, this short period occasionally struggles

with disorders as well, making the patient's life more difficult and causing problems to the care providing nurses, doctors.

When planning surgery, the surgeon and the anaesthesiologist inform the patient about the planned interventions, *expected benefits and disadvantages* and about the potential *complications* during an anaesthesiologist's round. After the appropriate information has been provided, the patient's concerns and fears can be recognized, , and a manageable solution can be found, during which process communication plays an indispensable role.

It quickly turns out that the saying "minor surgery, minor pain, major surgery, major pain" is not true. From the patient's point of view a *minor intervention* may be accompanied by very intensive pain, which may be due to the patients and their families expecting minor pain on the one hand, and the patients' doctors not applying the care protocol for major pain on the other hand, so both are very surprised. Patients may possibly be ashamed of how badly they tolerate such a small intervention, so they do not communicate it properly towards the care providing nurses and doctors. In contrast to this, expressly major surgeries can be performed with almost unnoticeable pain if there is a balance between the preparation, the surgical techniques, the surgical anaesthesia, the postoperative analgesic techniques and the patients' care and management. It is clear that the success of postoperative analgesia is the result of the dynamically changing ongoing process on the *patient-nurse-doctor* axis, which can be affected by the communication between patient and family, the nursing and medical attitudes, the applied techniques, the quality and quantity of the admeasured medicines, the methods and frequency of application.

A number of seemingly simple *environmental factors* also play a role, e.g. the presence or absence of windows, their size, location (overlooking a green area or a brick wall). The condition, the expected treatment results, the attitudes of the other patients in the *patient's environment* may very well improve or worsen the situation. The management of patients who are horrified of surgery and surgical pain by applying *pre-emptive, conscious and behavioural exercises* can reduce the preoperative and postoperative stress, pain intensity, painkiller consumption and can improve the efficiency of the treatment, can cause positive changes in the cardiovascular and pulmonary function indices and it can accelerate the recovery process.

Postoperative pain is acute pain, together with all of its existing physiological, pathophysiological *complications.* It causes emotional and physical suffering to the patients, it disturbs their sleep and normal relaxation, cardiovascular effects, such as hypertension and tachycardia occur, the sensitivity of the myocardium becomes increased, there is susceptibility to arrhythmia, enhanced demand for oxygen and increased oxygen consumption. The blood flow and cardiac work efficiency deteriorates. Respiration becomes more superficial, tachypnoea occurs, dystelectasia, atelectasis, mucous discharge retention develop and oxygenation worsens. The risk of the appearance of pneumonia in the dystelectasial areas increases. The impaired peripheral circulation, immobilization, the delayed mobilization due to the pain that appears upon movements, the weakened respiratory work are favourable of developing deep vein thrombosis. Stress impairs the intestinal activity, slowing down the passage. Untreated severe pain is a risk factor for the development of chronic pain. The inadequately treated pain leads to multiple organ dysfunction.

Postoperative *pain must be measured.* The patient's current pain has to be assessed with simple methods, with visual or verbal analogue scales both at rest and in motion. Pain must be measured *before and after* any *therapeutic intervention.* The necessary measurements are to be carried out at the postoperative monitoring room, at the intensive care unit or at the operating unit, *in the case of intensive pain* they have to be performed *frequently,* initially every 15 minutes, once in every 1 to 2 hours later. The maximum value must be specified *(interventional threshold),* above which intervening is needed, e.g. when the patient scores 3 at rest, 5 during movements (on a 10-point scale).

The degree of pain, the response to treatment has to be clearly *documented.* Patients who communicate with difficulties or do *not communicate* at all, children, the elderly, unconscious or patients with physical or mental disabilities, those who do not speak our language must be particularly carefully monitored. The sudden and *unexpected severe pain* must be immediately examined, wound dehiscence, infection, deep vein thrombosis should be considered. *Obvious pain* must be *treated* immediately even without questions. If possible, the patient's *family members should be initiated to get involved* in communication.

Today, modern postoperative analgesia is *based on regional anaesthesia* due to its beneficial physiological effects, good tolerability, adjustable duration, its longer term sustainability and its cost effectiveness. Its most important benefits are *saving on opioid analgesics, the avoidance of respiratory depression, prevention from dystelectasis, atelectasis and discharge retentions, avoiding ventilation, mobilizability,* favourable cardiovascular effects, the decrease in *deep vein thrombosis* risk, reduced *pulmonary embolism* occurrence, a smaller *risk of bleeding,* creating improved *liver and kidney perfusio*n conditions, faster *wound healing* and *recovery,* as well as providing comfort. Theoretically regional anaesthesia should be performed in case of any surgical procedure but unfortunately it does not cause complete insensitivity and relaxed musculature e.g. in the course of lung surgeries, abdominal surgical interventions and in case of brain surgery. In these cases, the opportunities for *regional anaesthesia* application *must be searched* for to supplement and complete general anaesthesia. Thoracic paravertebral blockade, thoracic EDA, coronary blockade are added to the previous examples. Most commonly the regional anaesthesia that has been *started* for surgical anaesthesia can be continued as analgesia in the *postoperative period,* therefore, it is appropriate to chose the cannulation technique.

Postoperative pain relieving strategy: Analgesia is basically a causal therapy. Multi-modality points of view have to be taken into account in pharmacological treatments as well, by applying combinations of medications that affect several points of the body. The role of regional anaesthesia is of outstanding importance.

Local anaesthesia (LA), spinal anaesthesia (SA) and epidural anaesthesia (EDA) are low technical demand regional anaesthesia. The following types of anaesthesia are of higher technical, equipment and experience demands: ultrasound guided plexus blockade (UHV PB), continuous plexus blockade (Cont-PB), continuous epidural anaesthesia (Cont-EDA), continuous spinal anaesthesia (Cont-SA), combined spinal epidural analgesia (CSEDA) and patient-controlled epidural analgesia (EDA PC).

Naturally, high-quality pain relief and comfort can be reached by patient-controlled intravenous opioid admeasurement (PCA), which is qualitatively a higher level analgesia at intervals or in continuous infusion vs. adhesive bandage dosages, since it takes the patient's current condition, needs and analgesic demands into consideration. The physical opportunities (rest positioning, medical gymnastics, breathing exercises, massage), instrumental physiotherapeutic possibilities (electric current stimulation, transcutaneous electrical nerve stimulation, TENS, cooling, heating), depending on their local access: acupuncture, magnetotherapy and psychological procedures are not negligible either.

The treatment of chronic pain

In the treatment of chronic pain, the new directive passed in 2010 *puts the multi-modal interventions to the front.* According to the guidelines, the long-term approach to pain relief, which includes periodic revisions and re-evaluations, must be *planned, developed and applied,* as part of the general treatment strategy. In addition, whenever possible, a treatment targeting analgesia must be interpreted as part of a multidisciplinary patient care.

Every admitted patient with chronic pain has to possess a well-documented medical *history, physical examination, pain assessment* and a chosen *treatment strategy.* The data regarding pain must include the general medical history, the timing of the appearance of pain, the evolution of pain, the history of the current symptoms, the results of the previous diagnostic tests and interventions and the current therapies. *The cause of pain and its effect* on the patient's life *has to be measured and documented.* The patient must also be assessed from psychosocial aspects, including the presence of psychological symptoms (anxiety, tension, depression, anger), the psychiatric symptoms, the existence of diseases, the personality traits, medicine usage, abuse and coping mechanisms. Proper *nervous system* and *musculoskeletal physical* examinations are to be performed.

Chronic pain is multifactorial in nature. In order to efficiently relieve chronic pain, an individualized treatment plan (analgesic plan) is required, in the compilation of which the patient, the nurse and the physician must cooperate. The purpose of chronic pain management is not necessarily the final elimination of pain but its treatment and the reduction of the acute phase exacerbations. A psychological and physical state assessment is necessary before drafting up the management plan. Other than physical limitations, psychological and social changes also occur in patients who live with chronic pain. Living with an illness can change interpersonal relationships and the relationship to work and leisure time. Chronic pain patients are almost always depressed, so the management plan must include a psychological assessment with standardized questionnaires to assess depression.

Other than pharmacological analgesia, non-pharmacological pain-relieving procedures must be given a scope in chronic pain management, since the application of the latter makes patient care more complex and improves the patients' quality of life.

Education, the evaluation of their experiences, staff attitude and training must be considered part of the pain management practice. The education of chronic pain syndrome patients is essential. Parts of the educational program are that they should be made clear about the aetiology of pain, they should be provided basic knowledge of anatomy, an insight into the reasons for the application of imaging techniques and they should be active participants in the compilation of the management plan. In favour of the cooperation the patients involved should receive information about the effects and side-effects of the medications they take, about the injections, medical gymnastics and the non-pharmacological pain-relieving procedures. The patient must understand that chronic pain is persistent but manageable and in this their own commitment is indispensable.

In chronic pain *numerous medicines* can be used besides the standard pharmacological therapy. The *anticonvulsant* agents used in epilepsy and *antidepressants* can be used as part of a multimodal analgesic therapy. The *long-term oral opioid* products may also be added in case of neuropathic and low back pain, just as in the form of transdermal adhesive bandages, sublingual preparations and immediate action tablets. In some patients *NMDA antagonists* (particularly in neuropathic pain), nonsteroidal anti-inflammatory drugs (e.g. in case of pain in the back and in the joints), *skin surface applicable agents* (e.g. in peripheral neuropathy) can be used as well as the administration of *benzodiazepines* and *muscle relaxants* can be considered. The elaboration of proper *monitoring* and *treatment strategy* regarding unexpected effects and complications is worth being carefully considered in patients undergoing long-term pharmacological therapy. *Physical and recovery locomotor therapy* can be used in almost all patients suffering from chronic pain, just as *cognitive behavioural therapy, biofeedback, relaxation training, supportive psychotherapy* and group therapy can be recommended.

Low back pain. Low back pain is one of the types of chronic pain affecting the most people in the world. Almost everyone has had or will have low back pain at least once in their lifetime. It affects 80% of the adult population. In a lucky case an *acute pain experience* appears generally after a bad move, strenuous outdoor work, lifting or exercising without adequate warm-up or as a result of a trauma that has affected the thoracic or lumbar region of the spine. In the majority of patients the pain *goes away by itself* within a few days and seeing a physician does not happen. In the course of numerous directive analyses, several substantial commonalities can be discovered in low back pain diagnostics and care. It is a crucial aspect in each directive to have an accurate medical *history making*, questions focusing on low back pain, the beginning, the development, duration and degree of the pain, the assessment of the psychosocial risk factors and a *thorough physical examination.* It is also important to classify the patients' pain according to the *three non-specific low back pain groups.* These are: the common *low back pain,* low back pain with *root involvement* and low back pain with *spinal canal constriction.* Further anaemnestic data and examinations are needed to clarify the *specific causes* of low back pain, which may be of *tumorous* or *infectious* origin, or pain that has developed as a result of *compression fractures* or *ankylosing spondylitis.* It seems that regarding non-specific low back pain, the traditional care, namely the sequence of bed rest, spinal X-ray, medication and neurosurgical intervention, must be broken with.

Interventional pain management

Interventional pain management is a very recent medical subspecialty, which refers to the coordinated work of the physicians, nurses, assistants and imaging analysts of various medical professions operating, in many cases, as a virtual organization. Interventional pain management is meant to *identify and treat* the patient's *pain "generator".* Its aim is to reduce or eliminate pain, to improve function and quality of life, to promote returning to work and to avoid invasive surgical procedures. Interventional pain management uses *minimally invasive techniques* for diagnostic and therapeutic purposes, based on the practice of *regional anaesthesia* on one hand and *imaging diagnostics* on the other hand. Not surprisingly, anaesthesiologists, radiologists and imaging analysts are committed to play a key role in the implementation of interventional pain management, while in the indication of relieving pain almost every medical specialty is represented.

The interventions can also be grouped according to *anatomic regions.* The blockades of the *ganglion stellatum* and the *Gasserian ganglion* are the most common on the head and neck but there is an inclination towards performing interventional treatment of the superficial or deep *cervical plexus* and the blockades of the arm plexus *(brachial plexus)* are preferred to be done by interscalenous, supra- and infraclavicular and axillary punctures. The blockades of the plexus and peripheral nerves are usually carried out by ultrasound control and to a lesser degree, by fluoroscopy. These interventions are applied in case of chronic pain in the head and neck regions and in the upper limbs and in *complex regional pain syndrome* cases. On the neck and trunk *(cervical, thoracic and lumbar) paravertebral* blockades, *root blockades, spinal facet joint* injections, *foraminal injections* and *epidural interventions* are performed. If a root or a nerve formation can be safely brought to vision, the anatomical marker points can be determined and the needle point is clearly visible, the intervention is performed by ultrasound, whereas in all other cases CT or MRI is used with *striving for maximum security.* In the case of experienced specialist physicians facet joint and root blockades can be performed manually, in problematic cases *fluoroscopy, ultrasound, CT or MRI* is necessary. On the chest *intercostal and pleural* injections can be administered in cases of intercostal neuralgia and chronic chest pain. In the abdomen the blockade of the *celiac ganglion* can be performed in case of chronic inflammation of the pancreas. The blockade of the *ganglion impar* or *intrathecal lumbar neurolysis* can be done for relieving chronic pain in the pelvic and perineal region. In case of pain in the lower limbs, *lumbar sympathetic* blockade, *psoas compartment* injection and interventions of the *lumbar and ischiatic plexus* and their associated peripheral nerves can be performed.

Flexibility, suitability, good problem recognition and problem solving skills are needed from all the professionals involved in the pain management field, since, due to the significant differences among patients, almost *each therapy is unique.* Naturally, taking the individual differences into consideration, the elaboration of common protocols for the procedures needs to be developed.

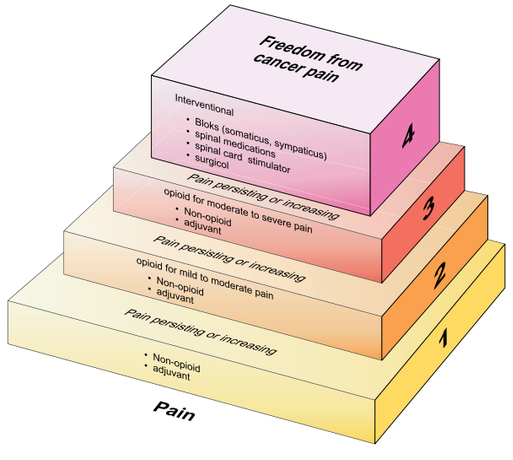
Cancer pain management

Cancer pain is constant acute pain, which demands the patient's physical and mental reserves and affects the patient's social and societal relations. The pain management of cancer patients is a *multidisciplinary* task. Its analgesic procedures, medical treatments, pharmacological, physical, psychological and interventional strategies summarize all the possible modalities of pain management, closing with pain relief for dying patients. 50 to 75% of cancer patients experience moderate or severe pain during their disease, since the pain is a dominant symptom and most of the time it is *multifactorial.* Despite the guidelines the applied analgesia is inadequate in a high proportion of patients and that is why the *fourth step* was introduced in the analgesic ladder of the WHO, which lists the most serious interventional techniques.

Pain *can be treated* and keeping it under control is an important *part of cancer therapy.* Appropriate consultation and *communication* with the *patient and the care team* is necessary to find the best possible solutions and their application. The best and most efficient way of pain relief is, if pain is *stopped from the time of its appearance* and it is *not allowed to get stronger.* In cancer pain management it is an important factor to recognize the extremely large number of factors in its development and the many available treatment options. *Each patient's pain relieving strategy is different* and it is not enough to apply one or two analgesic modalities, the base and supplementary procedures *most needed for the patient* must be found. The body does not become immune to painkillers, there is no need to save them for later. The technological development, the refinement of *imaging techniques* and their having become available allows a wider use of interventional techniques, so ultrasound may also open new perspectives in the treatment of cancer pain. Interventional pain management is not yet a widely used method but it is a new and progressively developing, efficient multi-disciplinary field of cancer pain management and the practice of pain therapy.

The role of pain clinics

Pain clinics are healthcare services that focus on the diagnostics and treatment of chronic pain. Some of them specialize in a *narrower area,* e.g. in low back pain, while others provide a wide range of *diagnostic and therapeutic* interventions in different areas. They often help people in pain with a *multidisciplinary approach,* they provide an active role to the patients in understanding, accepting and controlling their own pain. They offer lifestyle consultations for the realization of a fuller life and for the strategy of living together with pain. Ideally professionals of *several fields,* such as neurologists, oncologists, physicians specializing in musculoskeletal diseases, psychologists and anaesthesiologists work together at the pain clinics. The invasive interventions are performed by specialists dealing with interventional pain management, primarily by anaesthesiologists. The internationally accepted analgesic framework of the pain clinics include ablation, acupuncture, various nerve blockades, botulinum toxin, electrical nerve stimulation, epidural steroid injection, medication directed into the subarachnoid space of the spinal canal, the minimally invasive injections near the spine, medication therapies, physical therapy, psychological therapy and trigger point treatment.



Picture 2. Pain and relieving pain, pain management on the basis of the WHO pain ladder

The role of nurses in relieving pain

In addition to the previously described assessment, the analgesia-related role of nurses are summarized below.

It is the nurses' responsibility to *acquire,* maintain and further develop the *knowledge and skills* necessary for the coordination of optimal pain relief. The nurses make sure that the patients or their legal representatives are actively involved in the treatment planning, while they understand and accept the treatment options and potential side effects or complications. They intelligently *inform* and educate the patients and their family in *a competent manner* about the current and anticipated method of pain relief. They instruct the other members of the staff about pain assessment and estimation, the treatments and the general obstacles that could hinder adequate analgesia. They *use* standardized *scales* for the *periodic measurement* and for the documentation of pain, in strict accordance with the currently applied interventions and patient's care policy of the institute. They set up and use a *nursing care plan* that prevents and relieves pain as much as possible. They *administer medications and apply therapies* according to the prescribed and ordered applications, flexibly using their knowledge, skills and experience to maintain security and pain relief. Based on indication they *initiate non-pharmacological nursing interventions.* As members of the hospital care team, as a qualified expert they ensure efficient care. They take care of the communication with the appropriate team members and the assigned doctors upon the occurrence of any side effects or if inadequate pain relief is identified. They *perform documentation* on pain assessment, the interventions, the elaboration and course of the therapy and respectively on any modifications of the plan in a clear and understandable way.

Informing the patient is of great significance in relation to all interventions, both during the pain-related interventions and before the pain relieving procedures. In addition to the physician's information and potentially making the patient sign the statement of consent, it is important that nurses provide appropriate information to the patient in accordance with their competence. The education of patients suffering from pain is indispensable. The educational program includes providing information e.g. on the aetiology of pain, basic knowledge of anatomy, imaging techniques, medication effects and side effects, non-pharmacological pain management and it also involves participation in putting together the treatment plans.

It is important that the patient cooperates in the course of the treatment.

In the *planning* stage it is necessary to set realistic outcomes with time limits, e.g. the elimination of abdominal pain caused by surgical incision within one hour. The pain relieving plan should be made together with the patient. It must be observed whether the pain is alleviated or eliminated by changing body positions, massage or other non-pharmacological analgesic method. In case the patient is open to the use of relaxation techniques, to operant conditioning or to cognitive therapy, s/he is to be directed to a psychologist. The patient must be encouraged to fill in the pain rating scales before and also after the intervention. The obtained values need to be documented also in the nursing documentation.

The nurse may recommend the patients to keep a pain diary. It has to be written on a daily basis and the circumstances of the appearance or worsening of the pain need to be recorded, e.g. the time of the beginning of pain, its duration, the symptoms prior to the appearance of pain, the circumstances of its disappearance.

Only a doctor or a health care professional authorized by another authority may prescribe or alter the medical plan for analgesia. When the pain cannot be controlled under the currently prescribed conditions, it is the nurse's responsibility to report the found facts towards the assigned physician and to document this communication. Most often the nurse is the health care professional who is most involved in measuring the pain and in addition to this, who participates in starting the prescribed treatment, in the evaluation of the patient's responses and respectively in the modification of the treatment according to the patient's condition.

To achieve adequate pain relief, the prescription must include the *active ingredient, the dose range, the way of introduction and the frequency parameters (frequency, time limits, permissibilities)* which the nurse *may modify* or titrate to achieve an optimal pain control in accordance with the patient's needs. *According to* the current regulations and the *rules of the given institutions,* within the specified frameworks, knowing the patient's medical history and the development of the patient's current disease, besides the reporting and documentation requirements, nurses *freely choose* the applicable medications, the dosage forms and the application time, taking into consideration the dynamic development of the patient's pain. When substitutions of medicinal products with identical active agents are applied, the quality of the product should be taken into account also considering whether the specific active agent meets the aspects of emission, absorption and prolonged effect. In the case of the same active ingredient and the same quantity but different pharmaceutical products, the prescribing doctor's consent must be requested.

Pharmacological pain relief falls within the scope of a physician's competence, however, the administration of the ordered medications is the nurse's role.

Assessing and managing pain are the primary task of nurses and other health care staff responsible for dealing with analgesia. Sometimes pain is poorly treated, mainly due to the lack of appropriate training and knowledge and for fear of the sanctions from the regulatory authorities (opioid analgesics). Several publications surveyed the knowledge and attitudes of nurses about pain and its treatment. Based on the results, they underestimate their patients' pain level and due to this, pain relief is not implemented at the required level in the treatment plans either.

The purpose of the physiology of pain and learning about analgesia is to achieve the optimal level of nursing care in the daily practice of relieving pain. Therefore it is necessary to define the standards for care, which will lead to adequate clinical decision making skills in the care of either acute or chronic pain or in the pain management of the dying. Following the guidelines the nursing staff must be assured that their activities are useful and supported with evidence and the results of their work can be well measured and evaluated both for them and for their patients. Consequently, nurses should be aware of the institutional protocols, the most recent directives and that is why further training is indispensable in the area of pain relief as well.

Nurses must know the *administrational methods* of the different medication types and also the operating principles of the necessary equipments. In the case of PCA for example, they have to be familiar with the instructions as described by the manufacturers. The interoperability for the intravenous appliances must be regularly checked and ensured.

Compassion for the patient is essential. The nurse's task and goal is to reduce pain at least to the degree that the patient considers it acceptable and to recognize the patient's right to suspend or to refuse treatment. The patient's pain perception is the basis and optimal standard of all the analgesic methods, consequently advanced nursing estimation and evaluation include the subjective assessment of pain, objective data collection and the recognition of the need for psycho-social and religious support. If the patient indicates pain, then s/he is in pain. Pain relief continues even after the patient may have become unconscious. In critical cases, sedation is an acceptable control of pain and discomfort, when all other reasonable efforts fail. It is a fundamental issue that assisted suicide and euthanasia are illegal in most countries of the world and they are not acceptable alternatives to effective pain management.

The mitigation of pain as much as possible is a basic human right of every patient who lives with pain, so the fear of getting accustomed to the use of opioids and other analgesics must not be a barrier to effective pain relief. The individuals, whose medical history includes drug abuse or addiction, have the right for effective pain management, although they mostly require special care. The nursing responsibilities multiply with these patients but the time and energy spent is rewarded in the majority of the cases, since the patients, who are dependent in many areas, respond to the nurses who do their job very seriously with gratitude and affection, and the mutual understanding may cause real human values to emerge.

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16. Protection and Safety Requirements Part 1

BY KATALIN NÉMETH, KRISZTINA HOFFMANN, MELINDA JÁROMI

Safety requirements, hospital room environment, bedding, lying, laying.

The application of convenience means, mobility aiding devices, the basics of body mechanics

Safety requirements

The need for safety is included in several nursing models (Nancy Roper, Dorothea Orem, Faye Glen Abdellah, Dorothy Johnson, Jean Watson) about which more information is given in the chapter titled "Nursing Theories – Nursing Models". This chapter will discuss physical and psychological safety. Physical safety involves protecting the patient from current and potential sources of danger. Within their competence, nurses perform the following activities in order to provide physical protection for the patients: they ensure comfort, personal hygiene and a safe environment and they encourage mobility.

Hospital room environment

It is important that the atmosphere of a hospital room is appropriate, so that it can meet the patient's needs for rest and sleep. This sort of hospital room is bright, friendly, spacious, well-ventilated, comfortable, clean, and ultimately, feels,safe. In order to create the basic conditions for adequate rest, our understanding is extended with a survey. The survey will include the patient's individual needs, home environment and established habits. More information about the first step of the nursing process, namely about the survey, is reviewed in the chapter titled "The Nursing Process". The assessment of the environment must always take the patient's needs into consideration so that determining the sources of danger can be personalized. The sources of danger may arise from the furnishing and set-up of the ward (floor, doorsill, lighting, congestion).

SICK-BED

Just like the hospital room, a safe, comfortable sick-bed contributes to satisfactory rest.

Types of sick-bed

Inpatients in hospital and other care facilities spend most of their time in bed, the quality of which significantly affects their sense of comfort and security.

- new type sick-beds
- functional sick-beds
- traumatological sick-beds
- electric hospital beds
- sick-beds with a sliding foot-part
- nursing beds
- ICU beds
- delivery beds
- cots and children's bed

Further special types of beds are presented in the chapter titled "Wound Care and Wound Management".

THE CLEAN-UP AND TIDYING-UP OF PATIENTS' BED:

Making a bed can be done for outpatients and inpatients depending on how their conditions and restrictions allow it.

The accessories required for making a bed should be prepared on a bedding trolley so that, if necessary, there is easy access to replace the missing equipment:

- Bedding (pillow case, blanket cover, sheet, transverse sheet)
- Clothing (pyjamas, night gown)
- Laundry container
- Overlay mattress protector (it must be replaced in case of soiling or damage)
- Rubber sheet
- Rubber gloves
- Chair (where clean bed-linen can be prepared)

Tidying up a lying patient's bed

Bed rest

Bed rest is a state ordered by the nursing & medical team. Its physiological effects are used in case of certain diseases. As a result of bed rest, pain may decrease, the body requires less oxygen, further damage may be prevented and the body's regeneration may increase.

We distinguish between two types of bed rest, which are:

- complete
- partial

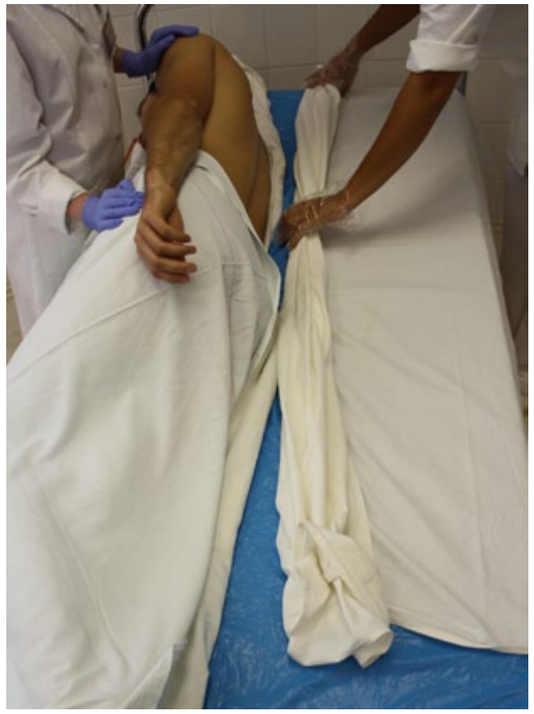
Table 1. Fekvő páciens ágyának a rendbetétele

Steps	Intervention	Explanation
1.	Assess the patient's condition, inquire whether you will also need to carry out any other interventions during making the bed, so you can properly take care of the any necessary preparations. Inform the patient about the intervention and its process.l	If the patient co-operates, you can encourage their involvement e.g. turning them on their side.
2.	Before starting to make the bed or change the bedding, make sure that the patient's elimination needs are met.	This will protect the bed linen from soiling and time/ money is saved by avoiding an additional change of bed-linen.
3.	Ensure the correct ward environment for the patient paying particular attention to respecting the patient's dignity. Any device (from the bed, night stand, chair) that is not needed while making or tidying the bed should removed to avoid any obstructions.	Ventilate the room before making the beds, then let it heat up to the proper room temperature. Use screens or curtains.
4.	Prepare the bedding on the chair belonging to the bed (put on top what will be used first), and never use another bed for this purpose!	It will enable the task to be completed quickly thus minimising cross-infection.
5.	Raise the bed to be comfortable to work with. If the patient's condition allows it, lower the head-end of the bed.	In order to protect the spine and to facilitate the process of changing the bedding.
6.	Do hygienic hand disinfection. Put the disposable gloves on.	It reduces the chance for the transmission of microorganisms.
7.	Remove one of the pillows from under the patient's head, and remove the pillow case off it. Place the dirtied linen in a laundry container and put the pillow on a clean chair.	If the pillow is also soiled, replace it.
8.	Turn the patient on their side while removing the other pillow towards the opposite side.	One of the nurses fixes the patient in this position.
9.	Another nurse rolls the soiled sheet and tucks it under the patient. If necessary, clean the mattress protector and allow it to dry. (Pictures 12 and 13)	Ensure comfort and dignity is maintained. Allow the patient to express any concerns during this procedure.
10.	Place a clean sheet on the bed. (Picture 14) As already mentioned, fold in the corners and the sides involved. Place another clean sheet between the soiled and clean sheet to prevent contact between the two sheets. Put the pillow into a clean pillowcase and place it on the clean sheet. Warn the patient that they will need to turn on their alternate side over the rolled-up sheets.	Sheets should not be shaken as this disturbs and therefore distributes micro-organisms into the atmosphere. The sheet should be wrinkle and crease-free, because it could irritate the skin and promote the development of pressure ulcers.
11.	Turn the patient on their alternate side and remove the soiled sheet and pillowcase, then put them in the laundry container (Pictures 15 to 17). Place the pillow on a clean chair. Clean the mattress protector on this side as well, then remove the clean sheet which was intended to protect the clean sheet.	While the mattress protector is getting dry, a clean pillow case can be put in place on the pillow.
12.	Roll out the clean sheet and fold in the corners and the sides involved as it has already been described.	
13.	Turn the patient back and place the pillows under their head so that it is comfortable.	

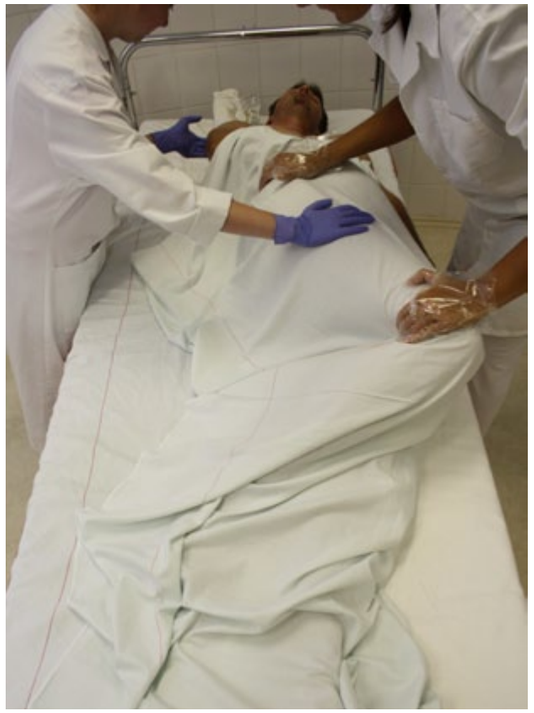
14.	Changing the blanket cover begins at the bottom of the bed. Undo the open end of the cover and make the corners free. Adjust the clean cover to these corners. Always draw back a bit from the soiled cover and put the clean cover on that part of the blanket, paying attention to the two not touching one another.	While changing the blanket cover, ensure the patient's dignity is maintained. If it is also necessary to replace the blanket, cover the patient with a clean blanket cover for that period of time.
15.	When finished with changing the blanket cover, turn the cover so that its open part points towards the foot-end of the bed.	Put the soiled cover to the laundry container (Picture 18). Extra attention should be paid to the bed linen which is likely to be infectious! Store it in a sealed bag, which is marked with the international yellow sign for indicating a biological hazaard.
16.	Adjust the position of the bed according to the patient's needs and comfort.	
17.	Treat the contaminated items accordingly and pack up. Restore the orderliness of the hospital room.	
18.	Do hygienic hand-washing.	To minimise cross – infection.
19.	Document the activities.	

Picture 1 Changing the bedding for a lying patient *(Pictures 1 to 7).*

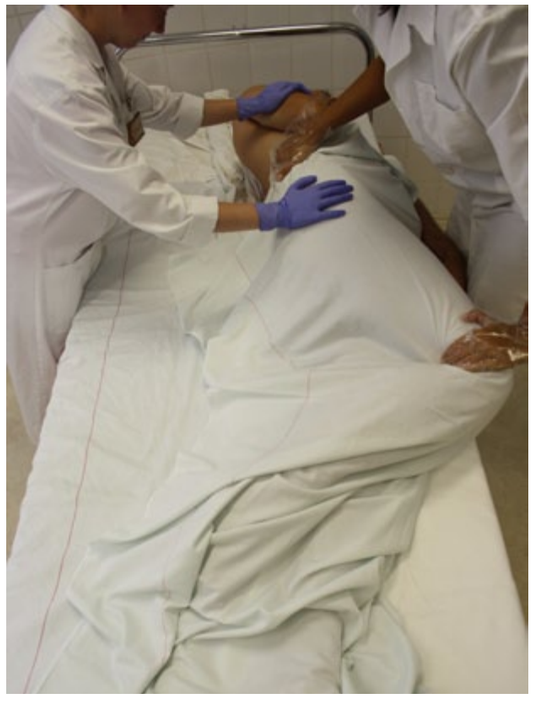
Picture 2



Picture 3



Picture 4



Picture 5

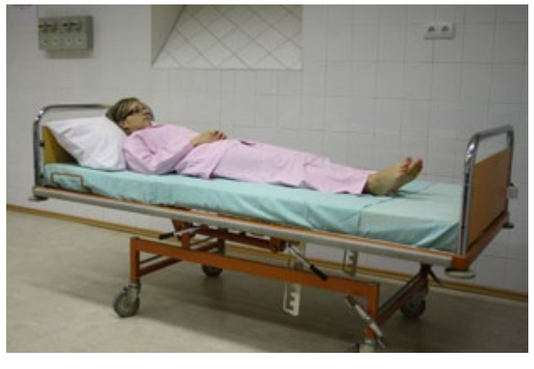
Picture 6

Picture 7

In case of *complete bed rest* the patient is not allowed to leave his sick-bed but they may choose their own body position. In case of strict bed rest the team members choose the position for the patient.

During *partial bed rest* the patient has to spend specified periods of time in bed, e.g. during hospital rounds, quiet time, transfusion application.

Physical conditions requiring bed rest are e.g. the day after major surgery, large area plaster fixations e.g. pelvic plaster, condition after spinal surgery.



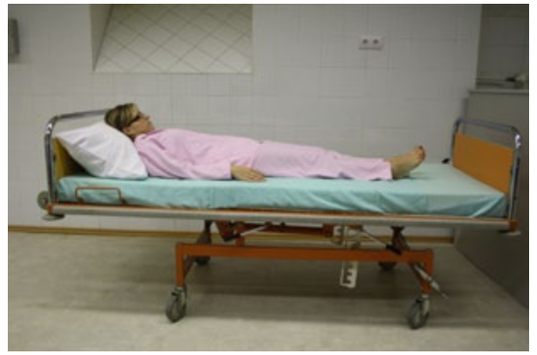
Picture 8 Active supine position

Lying, laying

Lying is the position in bed. The patient chooses their own body position according to their general condition and motivation.

Its forms are:

Active supine position (Picture 19). The patient lies on their back. Their joints are in a slightly bent position, their hands are next to their trunk. Physiological position.



Picture 9 Passive supine position

Passive supine position (Picture 20). The typical position of patients in a serious condition. Their body is stretched out.

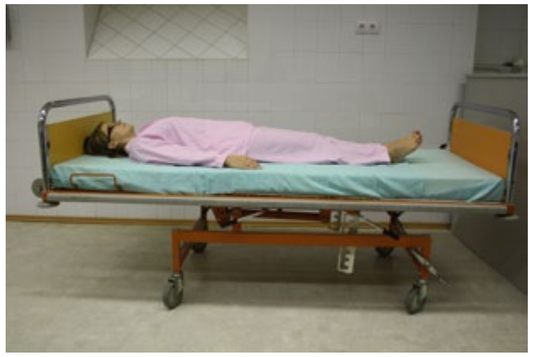
Active lateral position (Picture 21). The larger part of the body weight puts a load on the shoulder and the hip. The structural curves of the body are maintained. Physiological position.

Picture 10 Active lateral position

Forced positions. They are typical of pathological statuses. Due to pathophysiological deformities or pain, the patient takes an abnormal position, which confirms the diagnosis. For example, in the case of patients with cervical fractures, the foot rotates outward and the leg shortens on the side of the involved hip. This is also called a dead leg position. During meningitis the patient takes the so-called hunting dog lying position, they turn on their side and throw their head back. In case of pain caused by severe abdominal spasms, or gall-

stones, patients bend their lower limbs and pull them up in order to reduce the tension (Picture 22).

Picture 11 Forced position in case of abdominal spasms



Picture 13 Stretched supine position

Laying

Laying is the lying position ordered by the team members.

Its forms are as follows:

Laying back (Picture 23). It is applied after the majority of surgery and where fever is concerned. The patient lies on their back, a thin pillow is placed under their head and neck. A rolled-up towel or a cylindrical pillow should be placed under the lumbar section of the spine. While laying the patient on their back, the patella look upward, in the interest of which a trochanter roll is placed from the height of the trochanter major as far as the upper part of the hollow of the knee. Its aim is to prevent hip exstrophy.

Picture 12 Supine position

During stretched supine position (Picture 24) the patient is lying flat without a pillow, e.g. for two hours after spinal tapping, during diagnostic procedures such as CT or MRI, during resuscitation but upon its implementation the quality of the wiring of the bed fundamentally affects the patient's life expectancy.

Lateral laying (Picture 25). The patient's head should be in the centre line of the body and the rotation of the spine must be avoided by using supports. If leg support is not used, the patient's may slide down the bed more frequently. While turning a patient in a serious condition on their side, the head-part of the bed must be lowered, the patient has to be mobilized to one side of the bed, and then they should be turned by the nurse having one of their hands placed over their waist, the other one over their knees. If the nurse performs the laying alone, then before positioning the patient, a bed-grid must be put to the side where the patient will be positioned towards. A thin pillow should be placed under the patient's head and neck, their shoulder is brought forward and their arm is slightly bent. Place supports behind their back and bend the leg on top at their hip. Put a pillow between the two legs.

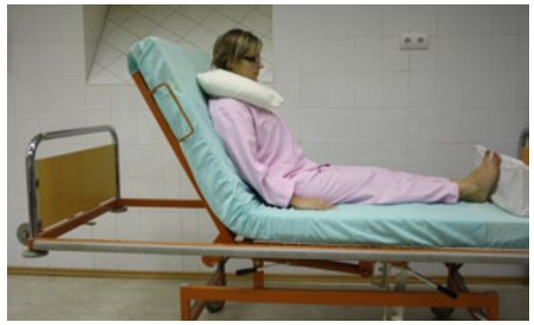
The high version of lateral laying is applied in case of dyspnoea. During tilted lateral positioning, the bed side must be lifted. Horizontal lateral laying is the position to be applied during examinations and interventions e.g. spinal tapping, rectal examination.

Picture 14 Lateral position

Fowler position

This position is connected to George R. Fowler (1848–1906), American surgeon (Ref). Two forms of the Fowler's position are identified, the low one, i.e. the semi-Fowler (Picture 26) and the high one, namely the Fowler's position (Picture 27). The head of thebed is raised by 30-60 degrees in case of low Fowler, and by 60-90 degrees in high Fowler position and the patient's legs are to be supported. The patient's knees are in a slightly raised position. Devices of convenience are needed to keep this position.

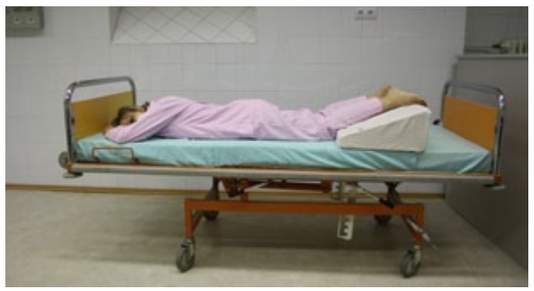
Picture 15 Semi Fowler position



Picture 16 Fowler position

Prone laying

The patient is lying flat on their stomach with knees slightly bent. Their hands are near their head,and the head is facing sideways (Picture 28). It is applicable in the case of spinal surgery and where extensive lumbosacral pressure ulcers are present. The development of cervical hyperextension must be prevented, in order to achieve this, a pillow must be placed under the patient's stomach and diaphragm. The patient's legs should be supported. It is advisable to turn the patient in bed, the patient's head should be at the leg-part of the bed, so that they do not get isolated from the events of the hospital room.



Picture 17 Prone position

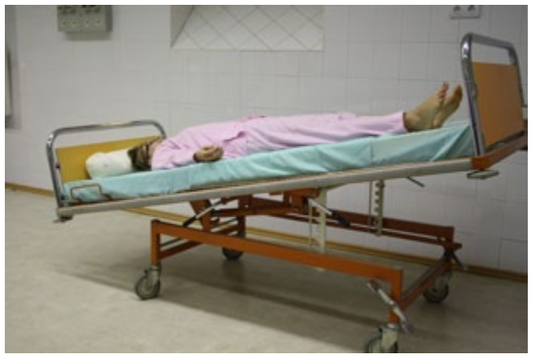
Shock

If a patients condition deterioration to such an extent that they go into a shocked condition , the patient's position should be to lie then on their back with their two lower limbs raised to 30 to 45 degrees. It is applied in case of a sudden drop in blood pressure, fainting, other symptoms of shock.

Remove

Trendelenburg position

In a Trendelenburg position the patient is lying upside down, in a 40 to 45 degree tilted angle, their limbs are elevated. (Picture 30).



Picture 18 Trendelenburg position

Anti-Trendelenburg position

In this position the patient's head is raised over horizontal level (Picture 31). The anti-Trendelenburg position corresponds with the Fowler or semi-Fowler position.

Its physiological effects are the fall in cardiac output (as a result of reduced venous back flow), and the increase in the reserve capacity of the lungs. It can also be recommended in case of conscious brain injured patients.

Picture 19 Anti-Trendelenburg position

Active and passive position changes

An active position change is the state in which the patient changes their position in bed alone, without help.

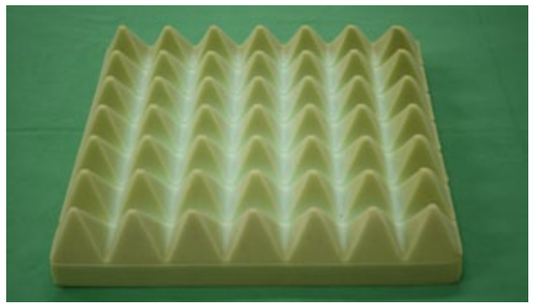
During passive position changes the patient can change their body position only with help because

- they are unable to move (e.g. suffers from joint stiffness);
- movements would worsen their condition, that is why it is prohibited by the physician e.g. in the acute phase of acute myocardial infarction;
- the patient is partially or completely disabled.

The patient's passive change of position is dependant on the nurse or carer, its professional implementation is their task.

Necessary and convenient means for changing positions are:

- sick-bed
- pressure ulcer cushion (Picture 37), which promotes patient's comfort when sitting

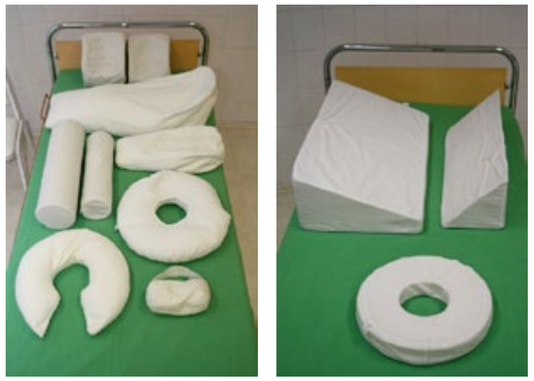


Picture 20 Anti-decubitus sitting cushion

- ladder bed handhold (Picture 38), which makes sitting up easier and helps the patient move, it is fixed to the bottom of the bed
- trapeze railing, which helps the patient's independent movement

Picture 21 Blanket supporter

- bathtub grab, which is a device to fulfil the need for safety
- bedframe, which can be mounted on the side of the sick-bed and it satisfies the requirement for security.
- patient fixation bands, straps are devices which temporarily restrict the patient in their free movement, e.g. arm fixation strap (Picture 40), trunk, leg, chest abdomen fixation straps
- Blanket supporter, bed tunnel (Picture 41). During care we can encounter conditions or therapies whre it is necessary that the blanket does not directly touch the patient's body (burns, the application of creams, ointments).
- leg support, which prevents the patient from sliding down in bed e.g. in a Fowler position

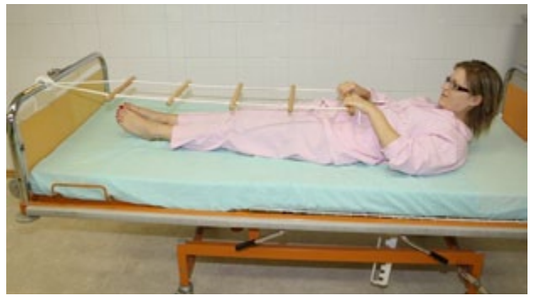


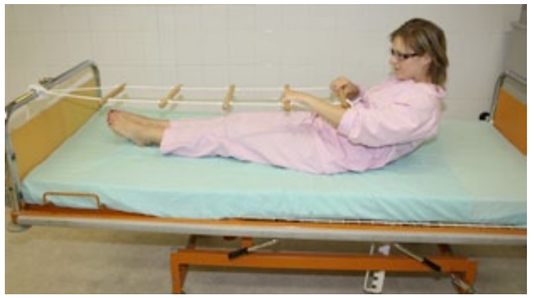
Picture 22. a, b Támpárnák

- pillows, which aids the patient's support in different positions
- Edelweiss support pillows, the purpose of which should be used in the fixation of the patient and it is a means for preventing pressure ulcer. There are several types, e.g. wedge pillows, cylinder rings, sitting rings
- perimed support pillows, which are aimed at supporting the patient during positioning and they are also means to prevent pressure ulcer formation.
- Heel and elbow rings, which are to promote the patient's comfort and to prevent pressure ulcer formation. There are more preventative pressure ulcer formation equipment mentioned in the chapter titled "Wound Care and Wound Management".
- patient rollers, with two main types, slide sheets and turning discs.

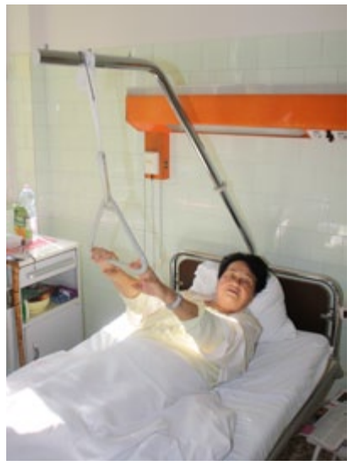
Sliding sheets make moving patients who have some mobility possible. The patient can help with footwork. The direction of moving the patient can be: upwards, down, and sideways. Their usage demands less effort from the nurses part, i.e. they minimise load on the spine.

Turning discs: the discs are made of rubber sheets, which are 36 to 40 cm in diameter, they revolve on each other with the help of metal balls, helping the patient to be seated on the room toilet, on a chair or armchair.

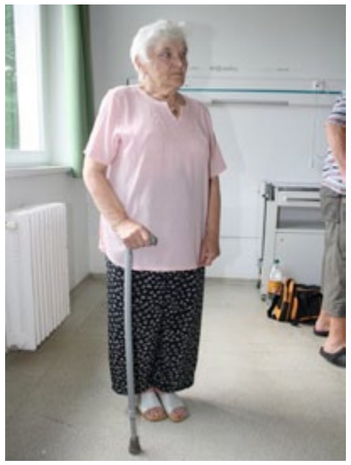




Picture 23 a, b
The usage of a ladder bed handhold



Picture 24 Trapeze railing



Picture 25 Járóbot

Picture 26 a, b Three-legged medical walking stick

- Patient lifting hoist: the patient is in a sitting position in it, they must be fixed. It works with a battery.
- bed stairs are 2 or 3-step stairs, which help getting in and out of bed.
- stretcher
- gurney (Picture 45)
- Commode (Picture 46)

Picture 27 Könyökmankó

Picture 28 Hónaljmankó

Picture 29 Gurulómankó

Picture 30 a, b, c Járókeretek
a) Gyermek- és felnőtt-járókeret

b) Összecsukott járókeret

The usage of zimmerframes (Picture 53)
c) Járókeret használata

Devices aiding mobility

- Walking sticks have an adjustable T-handle, they are made from aluminium
- Three-legged or four-legged medical walking sticks strengthen the feeling of safety for patients in maintaining stability (Picture 48)
- Elbow or Axilla crutches are easy on the patient's palm. They provide secure support. They are made of wood and aluminium tubular frames.
- Rolling crutches provide support for patients and they make walking easier. There are no brake systems on them, so it is not recommended for patient's with poor mobility or who are unable to hold any of their weight.
- Zimmerframes (Picture 53) are made from an aluminium tubular frame, the modern versions are folding walkers. They give support to the patient but due to pressure originating from the body weight, they may damage the patient's palms.

The height of crutches and zimmerframes are adjustable, their handles are made of wood, rubber or plastic non-slippery materials.

- Wheelchair (Picture 56)

Picture 31 Ágylépcső

They come in folding or fixed models. Their tubular structure is made of solid steel. They have arm and foot rests. Their carrying capacity is usually 120 kg. They can be used by patients independently or with assistance,and are fitted with brakes.

Picture 32

Gurney and room toilet (Pictures 32-33)

Picture 33

There are electric indoor and street types of wheelchairs.

- Patient lifting chairs exist in electric and hydraulic versions. Patients can be placed to the desired place with them but before starting lifting, patients must be placed safely in the chair..
- Rollators are recommended for recovering patients with limited mobility. The handle height can be adjusted depending on the patient's height. There are four and three-wheel models. The front wheels of the modern versions rotate in 360 degrees and the brakes can be used separately for the rear wheels. They are supplied with a front luggage rack.

Picture 34 a, b. Wheelchairs

Picture 35 Rollátor

The listed devices aid the patient's change of location and position but their improper applications may involve dangers for accidents.

There are certain patient monitoring systems which are able to detect and record patients' movements and if necessary, an alarm function can also be set. More information is given about them in the chapter titled "Protection and Safety Requirements" Part 2.

Body mechanics

Body mechanics is coordinated expenditure of energy with the harmonized functioning of the musculoskeletal system and the nervous system. Body mechanics includes the maintenance of correct body posture and balance in different work situations and during daily activities, especially the preservation of correct body posture during lying, sitting, standing, lifting, bending and walking.

The knowledge of body mechanics helps in the prevention of injuries associated with work and ineffective work. The reason for several work-related injuries is inadequate body, joint, muscle usage and poor muscle strength. These problems can be avoided by keeping ergonomic regulations, proper use of body and by adequate muscle strength. For example, if proper body mechanics are used during work and the treatment of patients, the number of injuries can be kept to a minimum, and also, by the using more economical muscle operation, the work is less tiring and less strenuous. The appropriate body mechanics help physical motion and therefore makes it more economical in reducing overload on the body itself,, normal muscle tone and muscle balance can be maintained. With knowledge and application of the proper methods for lifting and positioning, workplace spinal injuries and the number and severity of illnesses could be reduced. In the prevention of these injuries the adequate application of patients' moving methods are of significant importance.

Nurses and therapists use the knowledge of body mechanics to preserve their own health and to prevent patients' injuries.

The most common musculoskeletal disorder of health care workers is low back pain (LBP). This is a major occupational health problem. The second most common occupational health issue are knee problems. Within health care the most endangered professional group is nurses. Where nurses are concerned, musculoskeletal disorders are due to the large number of patient moving tasks, such as lifting, transfer, and positioning in the course of their role. According to surveys, during a normal working day nurses move 2000 to 2800 kg of weight (calculating with patients weighing 60 kg as an average) while carrying out their nursing tasks. (insert Ref)

Knowledge of body mechanics are built on the fundamental principles of functional anatomy, biomechanics, rehabilitational biomechanics, neurophysiology and also osteokinematics and arthrokinematics.

Biomechanics are part of biophysics, and it deals with the processes taking place in the musculoskeletal system of healthy individuals; while rehabilitational biomechanics takes into account the attributes of changes, which developed as a result of disorders. Osteokinematics deals with the voluntary joint movements formed in the joints, it describes the range of motions created by the bones, forming joints, comparing them to one another. For example, during a shoulder joint flexion, the humeral head does a pure spin-like rotating motion. Arthrokinematics deals with the geometry of joint

surfaces and the additional, accessory motions developing on joint surfaces. For example, the caput humeri in the fossa glenoidalis moves towards the caudal during a shoulder joint abduction.

Basic concepts of body mechanics

The definition of the positions of the human body in space are: sagittal, frontal and horizontal planes.

The sagittal plane is parallel to the vertical axis of the body, which divides the body into right and left parts if it is at the centre line of the body. The horizontal plane is the plane perpendicular to the sagittal plane. The frontal plane divides the body into front and back parts in the centre line of the body. According to the position of joints and limbs, we speak about a neutral position where a person facing forward, standing on two feet.

The human body's centre of mass, centre of gravity. The centre of gravity is the point of the body where the attack point of the gravitational force's resultant affecting the body is. In a homogeneous space of energy the centre of gravity and the centre of mass coincide in one point. The place of the centre of mass in the case of a human body in a standing position is not unambiguously defined by different authors: (1) according to Barton, it is at the height of the lower closing plate of the corpus vertebrae of the lumbar 5 vertebra (L5), (2) according to Balogh, it is at the height of the sacrum 2 (S2). The centre of mass moves off the specified location under the effect of motion, or forced movement, it may even get to a place outside the body, thus changing the effect of the force affecting the body. The practical significance of the centre of gravity is also important in maintaining the balance of positions. The closer the centre of mass is to the ground, the easier it is to keep the equilibrium, for example in the course of moving a patient, the centre of gravity gets closer to the ground and balance can be maintained more easily if working with a deeper bending of the knees.

The line of gravity is the line of effect of the gravitational force, which is the straight line pointing from the centre of gravity towards the centre of the earth. The line of gravity is vertical and it passes through the body's centre of gravity. In an erect, two-legged standing position, the line of gravity points at the centre of the support surface. Looking at it from sideways, in the sagittal plane, the line of gravity is at the centre of the head and ears, it moves in front of the centre of rotation of the atlanto-occipital joint, touching the cervical 2nd vertebrae and is situated in front of the thoracic (Th) vertebrae and it crosses the vertebrae Th 1 and 12 at the height of the processus articularis joint surface. In the lumbar section it touches the 5 vertebral corpus vertebrae, it then moves in front of the lumbosacral joint through the major trochanter and reaches the support surface at the knee joints, behind the patella and in front of the lateral malleolus. If the body moves, the line of gravity also moves, thereby changing the effects of the forces on the body. Its practical effect is: if the position of the line of gravity is changed, the muscles and joints used for the correction may get overloaded.

Point of rotation, rotational axis. The point durably remaining in rest is called the point of rotation. Connecting two or more points with these properties and we get the rotational axis. There is no dislocation, there is balance if the line of effect of the force line runs through the point of rotation. In cases like this for example, the joint surfaces, the intervertebral discs are not burdened asymmetrically, the load on the muscles involved in correction is minimal.

Load arm, leverage arm. A perpendicular line coming from the line of force intersecting with the rotation point is called the leverage arm. Its practical significance is that the larger leverage arm is applied to carry out a movement, or a task involving a movement, the more force is required. This can be used for example when the intensity of muscle strengthening exercises are increased. The larger the used leverage arm is, the stronger and more effective a muscle strengthening exercise is. It is important to consider the effects of the leverage arms, load arms regarding the manual handling of loads and patients. The smaller the used leverage arm is, i.e. the closer we hold the patient to ourselves while moving the individual, the less force that is required for example to move the patient.

Torque. The torque represents the moment referring to the given point by the force vector. The torque is the multiplication product of the force and the leverage arm.

Expressed in a formula:

$$M = F \times r \times \sin\alpha,$$

where the leverage arm $k = r \times \sin\alpha$. It is expressed in Nm.

Balance. The condition for equilibrium in case of an excess body is: the vector sum of the torques affecting the body is zero and the resultant of the forces affecting it should be zero as well. Expressed in a formula:

$$\sum M = 0, \sum F = 0$$

Support surface. During a standing position, the area formed by both feet is called support surface. The support surface determines the balance, the larger the support surface is, the easier it is to keep the balance, the more difficult it is to lose one's balance. Its practical significance is: while moving a patient, losing one's balance and its correction often goes with sudden, rapid, rotation-like movements, which is dangerous for the spine. If a deeper knee bending position for moving patients is chosen (the centre of mass is getting closer to the ground), and a wider stance position is used to carry out the task (with a larger support surface), the spine may be damaged to a lesser degree. In relation to patients, the support surface may be modified by the application of supplementary medical devices. From a patient's perspective, using a walking stick the support surface is increased, which will be the area formed by both feet and a walking stick.

The basic concepts of anatomy, biomechanics, osteokinematics, arthrokinematics and pathomechanics

The unit of the spine is the motion segment, consisting of two vertebrae and the intervertebral disc between them and their related muscles and ligaments.

- Brueger divided the motion segment vertically, it consists of a large front column and a back column. The front column is formed by the corpus vertebrae, the back column consists of the pediculus arcus vertebrae, the processus spinosus, the processus costalis, the processus accessorius, the processus articularis superior, the processus mamillaris, the processus transversus, the processus articularis inferior and the facies articulares. According to their function, the front column has a static, the back column has a dynamic role.
- Schmorl broke down the motion segment horizontally; according to his distribution the passive segment is made up of the vertebrae and the intervertebral disc, the ligaments and the muscles form the active segment.

During movements, the motions in the motion segment are created on the basis of the laws of osteo-arthrokinematics.

While bending over, during trunk flexion, compression applies in the ventral part of the vertebrae, the nucleus pulposus is pushed toward the dorsal, tension increase develops on the dorsal side of the annulus fibrous fibres. In the small joint capsule and in the ligaments (lig. interspinale, lig. suprasinale, lig. flavum, lig. longitudinale posterius) an increase in tension is observed.

As a result of compression (compressive force of an axial direction) the nucleus pulposus gets compressed, the tension of the fibrous annulus increases. The compressive force will spread to the closing disc of the vertebrae and then to the corpus vertebrae trabecular system.

In the course of turning one's trunk, the intervertebral discs are highly burdened upon the effect of the rotational force, since in the fibrous lamellas of the annulus the collagenous fibre rundown is diagonal (with the exception of the direct neighbourhood of the nucleus, where it is horizontal and in the outer lamellas the fibre rundown is vertical), it may be identical with the direction of the rotational motion. Rotation can also be observed, i.e. a rotational effect applies in the final position of the lateral flexional motion.

As a result of the various movements and body postures, different pressure conditions and force effects emerge in the motion segment and in the intervertebral discs, which may damage the discs in varying degrees. The biomechanical examinations give an accurate picture of the impact of different body postures and movements on the intervertebral discs.

Regarding Nachemson's surveys large forces being in effect for a short period of time cause the most damage to the motion segment, for example sudden movements or unstable surfaces, equilibrium reactions, such as the loss and regain of balance during unplanned patient lifting.

In these cases, the load on the intervertebral disc is doubled compared to that of in static situations, since the minimum balance reactions may involve a rotational mechanism.

Virgin and Farfan and their co-workers' research draws attention to the fact that it is not the compression force that causes the largest damage to intervertebral discs but the effects of the rotational forces.

According to Barton's biomechanical calculations, if a person weighing 70 kg lifts 20 kg with an incorrect technique, the intervertebral disc load on an L3 level is 206 kg.

The discs are subjected to different loads if a 5-kg object is lifted on the motion trajectory of the trunk flexion. In the trunk's 90-degree flexion position, the pressure on the disc is 720 kg, at a 120-degree trunk flexion it is 630kg, in case of 150 degrees it is 360kg, while standing erect it is 90 kg.

The protection of the spine, correct body posture and spinal usage during nursing patients

In case of proper body posture and spinal usage the load on the motion segment and on the intervertebral disc is significantly smaller. There are two major factors in developing a correct body posture. One of them is getting to know the correct posture and developing it, and the other one is to reach and maintain the required muscle strength and muscle extensibility to maintain the posture.

The criteria for correct posture are:

- the basin is in a centre position which can be achieved by gluteal and abdominal muscles-operation,
- the lumbar spine section may be relieved of the load by the isometric (static) operation of the abdominal muscles,
- the exoneration release of the lumbar discs on the ventral side may be achieved by raising the chest and by the stabilization of the proper position of the scapulae,
- the intervertebral gap increases by elongation (by the stretching of the spine in an axial direction), the intervertebral disc can get into a load-exempt position.

The basic principles of correct spinal usage are: (1) avoiding flexion and/or rotation which are the most dangerous movements for the spine (rotation done during flexion is the most strenuous), (2) the avoidance of sudden movements.

Protecting the knee joints

Surveys show that the second most common work-related injury among healthcare workers are knee joint diseases, the reason being that the load-exemption of the spine is often done by bending the knees to protect the spine. Based on the anatomical structure of the knee joint, a knee flexion larger than 90 degrees, done by body weight load, may damage the ligament system of the knees and it overburdens the menisci.

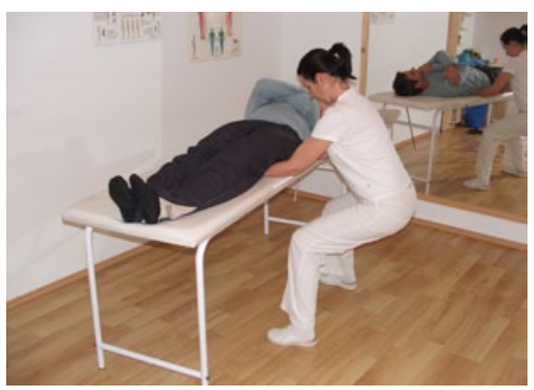
Bending forward from a standing position should be done with the trunk kept upright. From the aspect of the knee, the optimal joint work is bending as far as a 90-degree angle adopting a wide stance with the feet.. A movement performed in a 90-degree knee flexional position (Picture 72) can be done by changing the width of the feet. Upon work positions close to the ground, semi-kneeling, kneeling or sitting on the heels may be used instead of a full squat position.

Picture 36 Moving a patient with the protection of the knee joints

Applied body mechanics, ergonomics

At the patient's bedside, during the course of the work in patients' care, it is practical to avoid unnecessary trunk flexional movements. Instead of bending forward from a standing position, work tasks should be performed while sitting or standing in a stepping position with minimal bending of the trunk , for example during drawing blood, measuring blood pressure, or teaching walking.

Do not bend over to write or read, rather bring the object closer to the body. Patients' should not be pulled up by the arms at any time. Instead of lifting the patients, they should be assisted to roll (Pictures 73 to 75)



Picture 37 Instead of lifting, assisted should be given to the patient with movements that are used to slide them to the side of the bed

Picture 38 Aiding standing up from a sitting position with assisted movements

Picture 39 Rolling type movements are applied to turn the patient on their side

Use patient handling devices instead of manual handling. If possible, ask for help to move heavier than average patients. Do the movement while counting, together. Perform manual patient handling based on the patient movement methods which have been exactly practised.

When a stretcher is used, the stretcher should be lifted with a straight trunk while the knees are bent. During the course of carrying try to keep a straight posture, the load-exemption of the spine can be aided by tightening the abdominal and gluteal muscles.

During patient's handling, it is practical to keep the patient's body and centre of mass close to the therapist's body (in order to avoid discomfort, a pillow may be placed between the two bodies) and to perform the movement by moving together, during which the patient and the therapist move together (Picture 77).

Upon planning the movement, sudden movements and rapid balance reactions can be avoided, because the largest load for the spine is the effect of quick powerful forces being effective for short periods of time and the rotational mechanism, for example during balance reactions.

Picture 40 Moving a patient with the protection of the spine, aiding sitting up from lying on one's side

Before moving a patient, take the appropriate posture, adjust the correct body posture, so the movement can be started from a safe, stable position. (Picture 76).

A proper grip technique may reduce the load on the spine. A grip will be safe and moving the patient will be efficient if the patient's body region near the shoulder blades or the pelvis is held, not his upper limbs. If force is exerted at the body's centre of mass, it is easier to move the body, more movements can be achieved by a smaller force (Picture 77).

Assess the patient's existing capabilities and while discussing the planned movement with the patient, ask for their cooperation. This is the way to use the patient's remaining abilities during position change.

While moving the patient, use pre-planned, dynamic movements, so that handling the patient can be impetus-based and not muscle strength-based.

If during patient movement we work with body weight transfer (working with a wide stance with the feet and with bent or stretched knees; working in a stepping position, in a transverse straddle with the alteration of bending and stretching the knees, if necessary kneeling on the patient's bed and working in a kneeling or semi-kneeling position with transferring the body weight; (Alave S, Bobath's method) (ref), it is possible to work with a straight trunk being bent, with low muscle strength and economical muscle application (Picture 78).

Picture 41 Sitting up from lying on one's side

Picture 42 Positioning the patient further up in bed

Applying the above-described methods is more difficult in home care, due the beds very often not being height adjustable and a lack of space, not all of the patient handling techniques are applicable. If several patient handling techniques (Dotte's method, Bobath's method, atraumatic patient handling) are acquired, the appropriate methods can be found which are suitable for the patient's condition, their body size, the nurse's or therapist's body size and also the given circumstances.

Establishing and sustaining the nurse's or therapist's proper muscle strength is indispensable to maintain the health of the spine. The muscles involved in this process are: m. quadriceps femoris and m. gluteus maximus for lifting from the lower limbs, biceps brachii for holding the patient, m. erector spinae to keep the trunk straight, abdominal muscles and superficial back muscles for stabilizing and keeping the correct body posture.

The load-exemption of the standing working position can be done by tightening the abdominal and gluteal muscles.

In a standing position, if an individual steps up onto something with one leg, the lumbar section becomes straight and load-exempt.

Applied body mechanics are also important from the patient's point of view. In supine or prone positions and while lying on one's side, it is significant to keep the spine in a neutral position and to support it, which can be achieved with cushions. The principles of body mechanics should be taken into consideration also in cases of active place and position-changing movements. Getting up from bed from a supine position should be taught to be done without trunk rotation by the patient's turning on their side first, then sitting up from lying on their side with the help of supporting themselves on their lower arm.

Picture 43 Standing up from sitting with body weight transfer

The basics for proper sitting, as described above, also apply to a patient seated in a wheelchair.

During standing up from a sitting position, the transfer of the body weight should be applied. Supporting themself on a chair, or an imaginary chair, the patient carries out body weight transfer, during which the pelvis is raised and the patient gets into a straight standing position through bending their trunk while keeping it straight (Picture 81).

If possible, the patient should be encouraged to practice the elements of a correct standing position, even if they can stand with a medical supplementary device or they are made to stand up in a standing frame.

While walking, try to have the elements of a correct standing position kept, including cases when walking is carried out with medical supplementary devices, or next to a parallel railing, or with an artificial limb.

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17. Basic Hygienic Rules in Healthcare

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Infections developed during hospital treatment hinder the recovery of the patients and are a burden on the healthcare system. In this chapter, in order to prevent them, the system of nosocomial surveillance, the rules of asepsis and antisepsis are investigated, as well as promoting disinfecting and sterilizing processes to carry them out and also healthcare waste management.

Nosocomial Infections

One of the most controversial questions has been the issue of nosocomial infections. The recognition, the identification, the announcement, the prevention and the fight against infections cannot be done without the exact circumscription and definition of the area. There are infections which are not considered to have been originated from hospital or surgery by the specialist in healthcare, though they have. Thus they are not mentioned or reported and no steps are taken to prevent and combat them in the patient's ward or in their unit as they are not considered justified. This may lead to a worse situation, further infections, and unnecessary diseases which could have been prevented by an appropriate approach.

Nosocomial infections have to be reported in the hospital as well as to the State namely the Health and Medical Services (ÁNTSZ) and to the National Nosocomial Surveillance System (NNSR).

The Definition of Nosocomial Infection

The basic principles of CDC (Centre for Disease Control and Prevention)

Every registered hospital infection has to correspond to the general definition of nosocomial infections. Infections in which the pathogen or its toxin leads to a local or systemic pathogenic condition, and it cannot be proved that the infection existed in manifest or latent form before hospitalization, are considered nosocomial infections. Most of them are typically specific and multi-causal (attributed to several causes).

They are specific because they only occur basically in hospitalized conditions. They are multi-causal because they appear as a result of co-efficiency of several factors causing disease. They can occur among the members of the healthcare team or among visitors.

The diagnostic criterion of nosocomial infections on the basis of the Centre for Disease Control and Prevention (CDC) is that the first symptoms of the disease occur more than 48 hours after hospitalization (admission to hospital) and that the disease did not exist even in latent form when the patient was hospitalized for the first time. This definition seems to be the most acceptable with respect to nosocomial infections due to the general acceptability of CDC and its scientifically justified achievements.

The Pathogenesis of Nosocomial Infections

The origin of nosocomial infections can be endogenous (the pathogen comes from the patient's own flora), or exogenous (the pathogen does not come from the patient's own flora but from some other infectious source).

Primer endogenous infections are ones which are developed by microbes originating from the normal flora of the patient within seven days.

The source of secondary endogenous infections are microbes, unknown for the organism of the patient, instead of the destroyed normal flora, they get into the patient's environment in the hospital environment. If the normal flora is destroyed other bacteria taken from the environment replace it (change in the intestinal flora, mesenteric hypoxia, translocation of bacteria outside the intestinal wall, sepsis). It has been proved that Gram-negative intestinal bacteria can be found in the pharynx in case of 70% of the patients treated in intensive wards from the third day of care.

Tertiary endogenous infections are developed in case of neglecting hygienic regulations. In the last two cases infections are caused by microbes, already selected and are often multi-resistant.

Certain bacteria survive in the environment for a long time and generate infections in the organism of people susceptible to them. Exogenous infections caused by those bacteria are generally developed through the transmission of objects, or devices applied in invasive care. This time it has to be especially emphasized that these infections could be significantly reduced by the correct observation of hygienic principles and handwash. Infection can spread through direct contact, droplet infection or in aerogen way. Direct contact in most cases occurs directly through the patient bearing or defecating pathogen; indirectly through medical examinations or nursing activities, through devices used by the staff or through the transmission of their hands. The pathogen can get onto the objects in a pas-

sive way e.g. the contamination of the catheter, of the device used for taking blood, of the endoscope is responsible for these types of infections in 40%. Infection generated by shared infected objects may lead to accumulations and epidemics, because several patients can come into contact with them (for example food, water, medicine). Droplet infection can be generated by airway viruses mainly in neonatal and paediatric wards Aerogen spreading is not typical because there is a significant distance between the infecting source and the susceptible organism.

Clinical forms of nosocomial infections

The epidemiological identification of nosocomial infections takes place on the basis of CDC-definitions. The most common nosocomial infections are: urinary tract infections, pneumonia, operative infections, and sepsis.

The rate of the infections are not the same in each ward of the hospital. The above mentioned four most common infections make up the majority of cases. In the wards providing care for adult patients the rate is the following: intensive wards (10%–20%), rehabilitation wards (5–15%), surgical wards (3%–10%), internal medical divisions (2–5%), maternity wards (1–3%).

The importance of urinary tract infections are that they often lead to sepsis. Post-operative infections can increase the length of hospital stay, and they may lead to complications, in some cases to unexpected, fatal outcomes. Nosocomial pneumonias are of great importance because of their frequency and because they lead to death in 50–60%. Nosocomial sepsis makes up a significant rate of specific hospital infections (in general 8–10%, in Hungary 20%), their death rate is 20–40%. There is evidence to suggest that poor hygiene activity amongst health care staff perpetuated these statistics.

Nosocomial infections of the hospital staff

There have been reported cases of Nosocomial infections that have occurred within healthcare workforce as well as patient's. However, the most important and most common infections (urinary tract infections, pneumonia, post-operative sepsis) do not occur in the case of the staff which can be absolutely understood knowing the ways how infections spread.

There are Nosocomial infections which can lead to diseases of the staff. Their number is not significant and they rather belong to infections known from classical epidemiology than to special Nosocomial infections.

- Internal infections: hospital salmonellosis, or diarrhoea epidemic with unknown aetiology
- Airway virus infections: varicella and influenza
- Occupational infections (Tuberculosis, Human Immunodeficiency Virus (HIV) and Auto Immune Deficiency Syndrome (AIDS) infection.
- As a result of occupational infection, Scabies can occur
- Nosocomial Hepatitis infections of the staff, which are mostly Hepatitis B or C infections, make up the majority and the most important part of hospital infections among healthcare workers.

Nosocomial surveillance

From among the infections (sporadic or endemic) connected with healthcare, nosocomial surveillance deals with screening nosocomial infections at the institutions providing active in-patient healthcare. Its duty is continual, regular data collection, analysis, evaluation, and feedback. Its aims include the reduction of infections as well as to ensure reliable data which can be compared internationally by the help of standardized methods and to establish the strategy of preventing infections.

Nosocomial surveillance in the acute wards of in-patient institutions

The target of surveillance is to reduce morbidity, mortality and the costs incurred in connection with nosocomial infections; to gain a baseline for preventive activities; to prevent the development of nosocomial epidemics; to contribute to tuition, training and research; to promote the introduction of the technologies leading to the reduction of the number of infections; the formation of procedural regulations; to support the avoidance of technologies based on inappropriate practice by active infection control programmes, and to ensure the correspondence of hospital conditions with the requirements of the accreditation for the sake of further development.

Types of surveillance

- Full scope surveillance: the examination concerns every ward, every patient, and all forms of infections in the medical facility. This surveillance method was cancelled from NNIS by CDC in 1999 and is not recommended to hospitals.
- Aimed/selective surveillance: this is concerned with certain special infections – urinary tract, and wound infections, pneumonia etc. - mainly the wards taking great risks of infection, e.g. Neonatal Intensive Centre (NIC), Intensive Therapy Ward (ITO) , and also the unwell population, medical treatment, pathogens.
- Surveillance after discharge: surveillance of the infection of the wound after discharge has no standardized methods at present. It is recommended to include surgical patients returning to the out-patients' department in the surveillance population as far as the local situation makes it possible or to use other possibilities: to call the patient or the GP or to correspond with them.

Several errors can affect surveillance activity, which a healthcare specialist has to be aware of, in order to be able to do the best to avoid them. The more common errors include the following: the aim of the surveillance is not pointed out at all or is determined incorrectly; the communication is either insufficient or inadequate; the methodology of surveillance is not applied adequately; there are problems processing data; there is an inappropriate laboratory background or there is a lack of professional staff to undertake the surveillance.

At present there are three types of nosocomial infections which must be reported to the ÁNTSZ (State Health and Medical Services): sepsis of nosocomial origin; epidemic during hospital care and the infections caused by pathogens (e.g. Staphylococcus aureus, Kleibsiella, pneumonia spp., Pseudomanas aerugionosa, Acinetobacter baumanii, Esherica coli, Enterobacter, Staphylococcus maltophilia, Enterococcus faecium, Clostridium difficile).

Nosocomial surveillance is one part of infection control as well as an important factor of healthcare insurance of medical facilities, the lack of which, the medical institution or health service cannot be entitled to obtain licence to practice. Surveillance is carried out by a complex work team, the members of which include the expert in asepsis (a doctor, or a supervisor of public health and epidemiology), a microbiologist, an infection control expert and a special epidemiological nurse per 250 beds.

Asepsis, antisepsis

Nosocomial infections take the lead as reasons for the adverse effects of healthcare as can be seen clearly from the above mentioned facts. As a consequence the rate of morbidity and mortality, the time of hospitalization of in-patients, the use of antibiotics and the cost of healthcare are increasing.

The application of the basic principles of antisepsis and asepsis provide an opportunity for the reduction of the number of infections. They aim at keeping pathogens off the organism as well as the destruction of microorganisms.

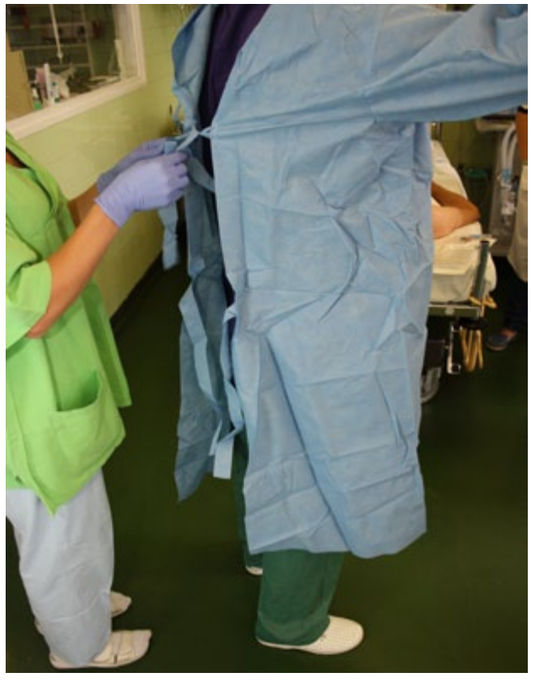
Ignác Fülöp Semmelweis (1818-1865) established the basis of asepsis before the advent of microbe identification in the 19th century, as well as inventing the pathogen and the therapy of the puerperal sepsis (childbed fever). He made his experience public before the knowledge of microbes and even before the introduction of microscopic researchers. The essence of his work was fully understood later, after the discovery of bacteria. He suggested chloride of lime for hand-wash and made it compulsory for his colleagues, medical students and nurses in 1847. He made them wash their hands thoroughly after coming out of the autopsy-room and before entering the maternity wards in the wash-basin at the entrance of the ward. He reduced the number of deaths due to puerperal fever to 1.2% by this activity.

Louis Pasteur (French chemist, microbiologist) thought as a consequence of his work that wound infections were caused by microscopic particles in the outside world (the discovery of the microbe). He claimed that the air was full of invisible pathogens which can be physically destroyed (disinfection).

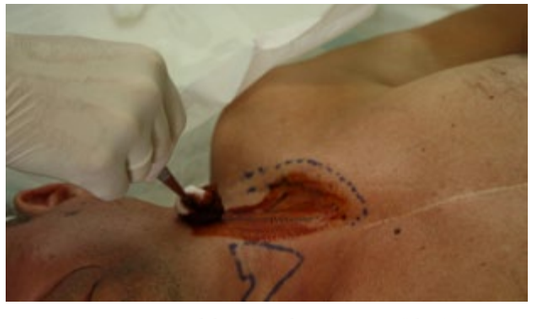
Joseph Lister (ref) (a Scottish surgeon) was the inventor of antiseptic technology, the antisepsis. He introduced it in 1865 and he proved that wound infections could be prevented by the elimination of microorganisms. He cleaned the wounds using carbolic acid (phenyl alcohol) and he used bandages pre-wetted in carbolic acid to cover the wounds so mortality rate was reduced where patients had received surgery. Due to the influence of his work they switched from antisepsis to asepsis, surgery carried out in sterile circumstances.

The complex working methods, processes, proceedings and forms of behaviour, applied during healthcare, by which microorganisms can be kept off the tissues, mucous membrane, cavities of the patient is called **asepsis.**

The application of sterile devices, materials, instruments, appliances as well as circumstances poor in microbes serve the assurance of the asepsis. The sterilization of the skin and the mucous membrane is part of asepsis and also the steriliza-



Picture 1. Az aszepszis lehetséges formái 1. Steril öltözék



Picture 2. Az aszepszis lehetséges formái 2. Fertőtlenítés, gumikesztyű viselése

tion of the devices applied during the invasive or non-invasive medical treatment.

It must be mentioned that the footwear of medical staff working in in-patient healthcare, more specifically soles of shoes) and the wheels of the trolleys used for making the beds and medical instruments play an important role in spreading pathogens in the medical facility.

In order to decrease it, it is recommended to use filth intercepting rugs as well as sterilizing rugs at the entrance of septic dressing rooms, operation theatres and wards of premature infants.

The practice of the implementation of asepsis before, during and after operations

The implementation regulations of asepsis refer to the patient, the team members, the operation theatres, the examination rooms, the wards, the applied instruments and devices as well. The elements of surgical asepsis include hygienic hand sterilization, surgical scrub and the use of sterile coats, rubber gloves, sterile isolating cloths, sterile devices, materials, sewing-threads.

The sterilizing bathing of the patient

After admission to the healthcare facility – not in the case of urgent, life threatening emergencies - patients are expected to have a clean bathing, taking a shower and using warm water and soap. The surface of the skin has to be treated by antiseptic where appropriate. In surgical patients undergoing an operation, it is recommended to wash hair one day before the operation.

Shaving of the skin area of the operation

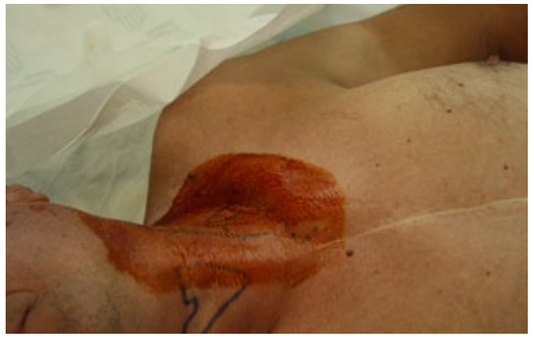
Shaving of the skin area of the operation has to be undertaken at least one hour before the planned operation. During the procedure skin injuries may occur, which might form an entry point for microorganisms.

The sterilization of the operative skin area

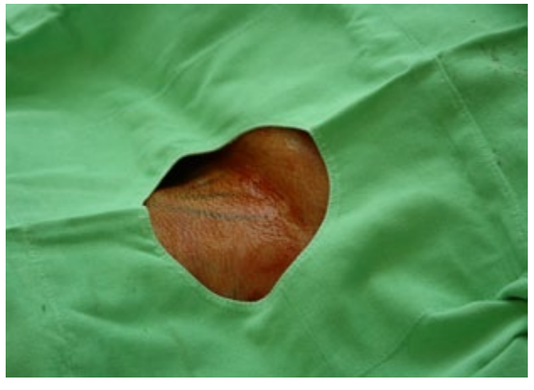
The area of the planned invasive medical treatment and the skin area around it as well as the periphery of the body cavities have to be sterilized. (Note: with the exception of the mouth cavity, it should be sterilized only in appropriate cases because of its sensitivity and its sensory functions (sense of taste, barrier functions, ability of speech).

The skin should be washed moving away from the outward the planned line of intersection in concentric circles while forming the sterilized skin area. In case where the skin area is septic (infected) then the opposite direction should occur, from the direction of the periphery to the direction of the planned intersection should it be washed.

Picture 3. Szennyfogó szőnyeg alkalmazása



Picture 4. Műtéti bőrterület fertőtlenítése



Picture 5. Műtéti terület izolálása

The isolation of the operative area

The sterilized skin area has to be isolated by a sterile textile cloth before beginning the operation. The target of isolation is the prevention of contamination. The patient is protected from their own flora in the course of isolation.

The possibilities of the implementation of asepsis as far as the team members are concerned

With the use of the sluice system, change of clothes (with the exception of underwear, total change of clothes has to be done) and scrub are required. The person scrubbing cannot wear rings, a wrist watch, bracelets or nail varnish.

The implementation of the aseptic technology in the course of the operation

The staff who are in scrub garments and are directly involved in the operation, have to face each other during the operation. They cannot turn their backs to the operative area or each other for the sake of the assurance of asepsis regulations. If necessary, the change of gloves and instruments can be carried out.

Sterile sewing threads and gauze sheets are used to cover the wound, in care the insertion of a drain with a closed system is required.

The implementation of the aseptic technology in the post-operative period after the operation

The placement of the patient in the ward post operatively, is a significant factor. The general condition of their roommates and their infections can determine their condition.

The change of dressings should be done only when required and if appropriate. The order of the woundcare of the patients is not accidental, first the aseptic patients have a dressing applied. Sterile instruments and devices have to be used during the application of woundcare. When changing bandages wearing sterile rubber gloves is required in each case. Before and after applying a dressing to the patient, hygienic hand sterilizing is compulsory.

Antisepsis

Antisepsis is a series of complex chemical processes, with the help of determining which microorganisms get into the cavities, the wounds or the living organism are destroyed or their multiplication is hindered. It is a less effective process than asepsis.

Antisepsis can be treated a number of ways such as biological, physical, chemical and mechanic ways. Biologically :- to give a specific serum, vaccinations. Physically:- to assure adverse circumstances for pathogens, chemically:- to give antibiotics, to use iodine preparations, to apply H_2O_2, and mechanically:- which would be to open the wound to discharge any wound secretions.

The preparations used for antisepsis are antiseptics such as chlorhexidin, povidon-iodine (Betadine), triclosan, which are applied on skin surfaces, mucus membranes.

Decontamination

The main principle of assuring an aseptic hospital environment is to keep pathogens off the organism of the patient. This can be done in two ways:

- disinfection
- sterilization

Hospital rooms, furnishings, devices, instruments, textiles which the patient can come into contact with have to be decontaminated.

Sterilization is a condition forming complete sterility. It destroys even the dormant forms of microorganisms on the surfaces, materials and devices. It has physical, chemical and combined forms.

In the course of **sterilization** the aim is the destruction of the pathogens that have got into the external environment and the restraint of their infective ability.

The effective spectrums of disinfecting products can be classified into 7 categories:

1. Sanitary effect (reducing the number of germs), due to the applied sterilizing process e.g. washing off, the number of the pathogens is decreased.
2. Bacteriostatic effect (restraining the multiplication of bacteria), the vegetative forms of the bacteria are not destroyed, they remain viable and after the termination of the sterilizing effect they start to multiply again.
3. Bactericid effect (killing the bacteria), the vegetative forms of the bacteria are destroyed, the spores of the bacteria stay alive and they can spread the infection.
4. Virucid effect (inactivating the virus), the infecting ability of the viruses is lessened or inactivated, that is terminated.
5. Sporocid effect (killing the spores).
6. Fungicid effect (killing the fungi).
7. Parasiticid effect (destroying the parasites), the destruction of parasites getting into the environment, e.g. intestinal parasites, larva, ovules.

Picture 6. Az eszközfertőtlenítés megvalósulása osztályos körülmények között

The factors having an influence on the efficiency of the sterilization

General and specific technological factors of disinfection are responsible for having the desired effect and not decreasing it:

- disinfecting soiled materials
- characteristics of the material to be disinfected
- quantity of the microorganisms on the material to be disinfected
- temperature of the material to be disinfected
- time of exposition
- resistance against the disinfecting agent.

Disinfecting processes

The disinfecting processes can be divided into four groups:

- Physical
- Chemical
- Combined
- Special

1. **Physical disinfecting process** means the elimination of the pathogen by heat- energy as well as by not ionizing radiating energy.

Part of the disinfecting process is *cleaning*. The *mechanical cleaning* of the devices, covers, instruments is indispensable, which might be followed by the chosen disinfecting process.

2. During the **chemical disinfecting process** the antimicrobial effect is achieved by applying solutions, aerosols or gases. The factors influencing the effectiveness are chemical reactions, capillary active effect, selectivity, the concentration of the disinfecting preparation, the time of exposition, mechanical cleansing (see above).

Disinfectants (products of disinfection)

They have bactericid, fungicid, virucid effects, they damage living cells, and therefore they are mainly used for the disinfection of devices, objects. Hand and skin disinfectants, as well as bathing products, which do not damage the skin belong, to a special group of disinfectants.

The typical characteristics of an ideal disinfectant are to have a wide spectrum of effects. Their usage should be economical, they should have a pleasant smell, they should not damage the material to be disinfected, have a short exposure time and they should be able to penetrate effectively..

Antiseptics: they have bacteriostatic and fungistatic effect. They are used for the disinfection of mucus membranes and skin surfaces.

Chemotherapeutics and antibiotics: these belong to the group of drugs. They get into the human organism either orally or in a parentaral way. They are selective and have a wide spectrum.

3. **The combined processes of disinfection** include the combination of heat-energy with an infective solution and a previous motorised cleaning. The parts of combined processes are: disinfecting washing, disinfecting washing up, disinfecting cleaning.

Nursing devices, the equipment monitoring the condition of the patient, as the main sources of cross-infection

Cross-infections are the infections developed directly or indirectly in institutional circumstances which occur between two persons suffering from two different infections. The main mediums are the hand of the healthcare worker, his gloves and the nursing devices e.g. wash-basin, ear thermometer, binaural stethoscope, the wristband of the blood pressure apparatus (tensiometer).

The most common reason for cross-infection occurs because of the mistake made by healthcare workers as they do not wash their hands before putting on a new pair of gloves, for example.

The cleanliness of the equipment, their continual disinfection can decrease the incidence rate.

It is the responsibility of healthcare workers to clean the devices, as well as the equipment after use, in the course of nursing and before taking them to the next patient.

In the course of the disinfecting process the instructions of the manufacturers, the degree of the contamination and the characteristics of the equipment have to be taken into account.

The instruments can be divided into three groups according to their risk category: high risk instruments, intermediate risk instruments, low risk instruments.

- Surgical instruments, needles, syringes, work uniforms, catheters belong to *high risk instruments*. These instruments have to be sterilized before using them with the next patient.
- *Intermediate risk instruments* can be instruments with endoscopes as well as respirators. They have to be sterilized.
- *Low risk instruments* are stethoscopes and wash-basins. They are cleaned with water and detergent.

Human discharge can be disinfected by the method of mixing. The used disinfectant can be of solid or of liquid physical condition. The exposure time of mucus disinfectants can change between 2-6 hours, however that of more modern products can be 5 minutes e.g. CLINELL Sporocidal. In the last few years alcohol cloths which are used for skin disinfection before invasive medical treatments e.g. taking blood, injection, tapping, biopsy, removing sutures, have been placed on the market in this country, as well. Their common characteristics are that the ingredients in the cloth (chlorexidine, isopropyl, alcohol) have bactericidal effect. Their exposure time is 30 seconds (dependent on the manufacturing company) after wiping the skin surface. The cloths assure antimicrobial effect against the significant majority of microorganisms. The cloths can be put on the market uniquely or in bulk, not separated from each other.

Hygienic expectations as far as healthcare workers are concerned

The nurse has to remove all visible jewellery. Small, metalic earrings, no longer than the earlobes, can be worn. In some cases wearing a ring is permitted.

NOTE: for the sake of the stricter reduction of Nosocomial infections and cross-infection- it is not permitted to wear rings, bracelets, or wristwatches to work.

Ideally, sleeves of the uniform should be no longer than the elbow . Wearing ties (except bow ties) is not recommended, because they can be contaminated and pathogens can be transmitted easily. Wearing a cardigan of your own over your uniform or going bare –legged or bare-foot is not permitted either.

Rubber, plastic, leather shoes, slippers used in the healthcare system can be disinfected by washing, wiping, soaking.

Hygienic hand disinfection

Hand hygiene is one of the most important methods of the prevention of Nosocomial infections. The World Health Organization (WHO) launched a campaign for improving hand hygiene "Save Lives: Clean Your Hands" as part of the programme "Clean Care is Safer Care". "Hand Hygiene World-Day" was organised on 5th May 2010 for the second time.

Several scientific researchers studied the reason for low rates of hand hygiene compliance, which seems to be the length of the time devoted to hand hygiene and the lack of quick availability of hand hygiene instruments, consequently WHO and CDC developed a new method of quick hand infection, the alcohol hand rub, the implementation of which is simple and fast.

The forms of hygienic hand disinfection.

Hand hygiene is a complexity of processes and regulations for hand cleansing and disinfection.

Hygienic hand disinfection is a process in the course of which the so called transitory microflora on the hand surface is eliminated by hand disinfectant with a biocide efficacious constituent. Hygienic hand disinfection has two forms, disinfecting hand wash and alcohol-based hand rub:

- ***Disinfecting hand wash*** is a process in the course of which transitory microflora is eliminated on the hand surface by the hand disinfectant containing antimicrobial agent and surface active ingredient (tensid) besides adding water, dissolving and removing contamination on the hands (and the lower arms) - (one phase cleansing/disinfecting hand disinfection). Well-known detergents with disinfecting agent are e.g. Skinman, Scrub, Bradonett, Clarasept Soft.
- ***Alcohol-based hand rub*** is a process in the course of which alcohol-based disinfectant is applied to eliminate the transitory flora by dispersing it consistently, then rubbing it without adding water and wiping it. Well-known hygienic disinfectants are e.g. Skinman Soft, Bradoderm Soft, Descoderm, Desderman Gel, Sterilium.

Chart 1: The process of disinfecting hand wash

		Steps	Explanation
1.		Turn on the non-touch lever tap (medical) by your lower arm or elbow allow the water to run till it is lukewarm. (if a non-touch lever tap is absent, only there is only a traditional one, turn it on by using a paper towel)	Do not touch the tap with your contaminated hand because when you turn it off after hand disinfection using your clean hand, the pathogens may get onto your hand again.
2.	 	Put the prescribed amount of one-phase disinfecting soap on your dry hand by the help of your lower arm or elbow from the soap dispenser, then add a little water to make it foam and disperse it consistently on your hands.	The necessary quantity, dependent on the size of hands is about 2-5ml. ts indicated on the bottle by the manufacturer, check the exposure time of the disinfectant.

3.		Rub your palms moving them concentrically.	Doing so, can make the hand disinfectant foam and clean your palms.
4.		Fold the inner surface of the fingers of your two hands, then rub the area between your fingers.	A lot of pathogens settle in the area between fingers.
5.		Fold the outer surface of the fingers of your hands, then rub the area between your fingers.	
6.		Place your finger pads on your other hand, at the meeting line of the fingers and the palm, then clean the finger pads moving them sideways. Do this on both hands.	A lot of pathogens settle on the finger pads as well as at the meeting line of the fingers and the palm.
7.		Rub your thumb down your other palm, then the other way round.	Lots of pathogens settle on the thumbs.
8.		Rub the surface of your palms with your finger pads thoroughly.	Lots of pathogens settle on the palms.
9.		Rinse off your hand with lukewarm water thoroughly.	Pathogens settle on reusable hand towels.

10.		Dry your hands with a single use paper or textile towel.	Pathogens settle on reusable hand towels.
11.		Turn off the tap using a paper towel, or in case of non-touch faucet either by the elbow or by the lower arm.	Do not touch the faucet, as it may be unknown as to who touched it before with their contaminated hand.

The guidelines concerning hand wash/hand disinfection

Hand wash with soap and lukewarm running water has to be performed when starting work, after using the toileting and before having meals as examples. Hand disinfection with one phase cleansing-disinfecting substance has to be performed if contamination can be seen on the hands.

Hygienic hand disinfection with one phase cleansing-disinfecting substance has to be performed before and after work when there is no visible contamination on hands. Alcohol hand rubs must not be used in cases of infections caused by spore-forming bacterium (C. difficile), or if there is a hign index of suspicion. It is not recommended, either, in case of enteral epidemics.

It is strictly forbidden to use reusable textile towels.

Liquid soap, disinfecting liquid soap, alcohol hand disinfectants and skin lotions used for hand wash and hand disinfection have to be obtained from mechanical soap dispensers (which can be operated by the lower arm, the elbow, or a foot pedal), or from a dispenser with an electric sensor.

The condition of hands

Nail care, which should include the nails, the area under them, the nail-beds and skin formulation around the nail, has to be performed regularly. Take special care not to damage nail-beds when performing nail care. Nails should be kept short (< 0,5cm) and have rounded ends, avoiding sharp edges.

Sterilizing

The preparation of instruments for sterilization

The sterilization of reusable devices occurs in orderly fashion: collection, preparation, cleansing/disinfection, examination (maintenance), packing, sterilization, post-treatment, control, then storing and transportation. Take into account the methods, determined by the manufacturer and given in the manual of the instrument, in connection with the preparation of sterilization.

Collection, preparation

The preparation of the devices for sterilization starts on the spot of their use by collecting them separately. The instruments must be cleansed from the residues of drugs, corrosives (carefully, not damaging them) before putting them into containers. The collected items must not be stored longer than 6 hours because of the danger of corrosion in case of dry collection. Wet collection is a more preferable process, in the course of which the used devices are stored in a bowl containing instrument cleansing solution.

The next step is rinsing, during which blood dried on the instrument and drug remains are removed by water not hotter than 30 °C (protein is precipitated in hot water, which is difficult to remove later). Operative textiles can be prepared only if they have been cleaned by disinfecting washing in the laundry in advance. Bandages should be placed clearly into cotton sacks. Rubber and heat resistant plastic devices, which can be sterilized, are to be prepared in a previously cleansed and dried condition. Wet gauze strips are placed into tubes and into the cavities of hollow rubber devices (but not before plasma sterilization!), then they are classified according to size and use. Tubes, plugs, aspirators, laryngoscopes, catheters, duodenum- and stomach-tubes must be rinsed off immediately after use, then soaked in disinfecting solution. Glass and porcelain devices must be checked first, if any cracks or breaks are noticed, they must not be sterilized. It should

be noted that flexible endoscopes should be disassembled, components should be rinsed off and soaked, insufflating and inhaling appliances should be soaked in cold water after taking them apart.

Cleansing and disinfection

The third work stage is cleansing/disinfection when contamination left on the devices is removed by chemical and mechanical methods. Thorough cleansing is essential, as contamination sterilization is not safe.

Drying, checking and maintenance

Cleansed and rinsed devices must be dried appropriately before checking and packing them. Places for drying: drying case in a laboratory, under an infrared lamp, drying room.

Checking procedures must be carried out separate from the place of cleansing so that the device could not get contaminated again.

Chart 2: The sterilizing processes

	Process	Characteristics	Materials to be sterilized (examples)
1.	*Steam sterilization autoclave*	Sterilization with autoclave, saturated water vapour which precipitates in the course of the process, while the hidden energy of the steam is released and as a consequence microorganisms are inactivated and destroyed.	– medical manual devices (surgical instruments), syringes – microsurgical and dental instruments – heath care(operative) textiles – surgical bandages – rubber and reusable plastic devices – laboratory glass utensils – endoscopes (and other devices) parts in direct contact with the patients
2.	*Autoclave*	Sterilization with dry, hot air which is heated electrically and during the process it passes heat energy to devices placed in the sphere of action, so the pathogens on them are destroyed.	–medical manual devices (operative instruments) – syringes – microsurgical and dental instruments – on metal objects – glass and porcelain devices, containers – heat resistant powder, oil, fat
3.	*Etilenoxide (ETO) gas sterilization*	Sterilization with etilenoxide which has an antimicrobial effective agent, microorganisms are therefore inactivated or destroyed	–synthetic surgical sewing materials – rubber-and reusable plastic devices – anaesthesiology parts – parts of endoscopes (and other devices) in direct contact with the patient
4.	*Formaldehyde (FORMALD.) gas sterilization*	Sterilization with formaldehyde gas which has an antimicrobial effective agent, so the microorganisms are inactivated, or destroyed.	– rubber- and reusable plastic devices – anaesthesiology parts – parts of endoscopes (and other devices) in direct contact with the patient
5.	*Plasma sterilization*	Sterilization at 46 ± 4°C temperature with hydrogen peroxide plasma created by electronic field of force during which getting rid of germs happens at low vapour content.	– metal devices – oesophageal dilators – trocar capsules – rubber- and reusable plastic devices – cranial cavity manometer (pressure gauge indicator), wires – patients' body wires surgical engines and elements – Doppler's – ultra sound heads – ingredients of endoscopes
6.	*Sterilization in solution of antimicrobial substances*	The STERIS SYSTEM 1™ in this appliance the solution which contains peroxyacid has a sterilizing effect	– microsurgical instruments, special histological tweezers – intubation devices – laparoscopes – cameras – fibreglass optics – ultrasound probes – flexible gastro-colon scopes

Picture 19. a, b. Autoklávberendezés

Packing

The requirements concerning the packing of devices are included in regulations with different numbers, entitled "Packing materials and- systems for medical devices to be sterilized".

Sterilization

There are several sterilizing processes, the objectives of which are to get the material free of germs. In health care the following methods are applied: stem sterilization, autoclave, thermo sterilization, gas sterilization, plasma sterilization, sterilization in the solution of antimicrobial substances.

Appropriate storage of sterile objects

Strict observance of regulations concerning package and storage is necessary (at present according to standards numbered BS EN 868-1:1997 and DIN 58 953). One of the most relevant basic regulations is that with the exception of sterilization in solution, materials can be stored only in the package in which they were sterilized in. Sterile materials can be stored without opening them, furthermore it is not permitted to keep the objects taken from the package in liquids (e.g. alcohol). Sterile materials must be stored in a dry area, protected from UV-radiation and air flow, between 20-25 C, segregated from non-sterile devices, in a room which is separated and where there are minimal movements.

Appropriate treatment with sterile devices, solutions, packs

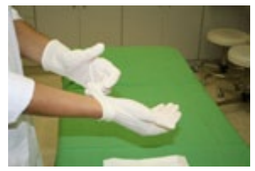
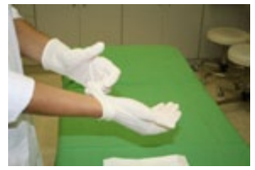
Sterile means a condition free from germs, that is, dormant stage of pathogens are not present, either. A sterile set is a pack in which devices as well as packages are sterile (e.g. catheters sets). When opening sterile sets, passing sterile devices to the field of use as well as pouring sterile solutions, it should be noted that hands, clothing and hair are not sterile and that a sterile object must not come into contact with non-sterile materials.

Putting on, using and taking off sterile gloves

Sterile gloves must be put on for performing treatments (mainly invasive), when required by the protocol of the medical treatment, as the implementation of sterile technology (e.g. use of catheters, chemotherapy, surgery) is inevitable to prevent infections. Non-sterile gloves are required for the use of treatments where contact with blood and other body fluids may occur (e.g. taking blood, bathing). Wearing gloves is not necessary for certain treatments (e.g. indirect taking blood pressure), however, if the condition of the patient makes it necessary (e.g. skin is bleeding and hurt), non-sterile gloves should be used.

Chart 3: Putting on sterile gloves

	Steps		Notes
1.		Perform hygienic hand disinfection	
2.		Check the package of the gloves, the expiry date, then fold out the outer pack and put it on a clean, dry paper so that the written notes on the inner cover should not be upside down.	If the surface is wet and the the paper becomes wet, it will become contaminated. The gloves within will no longer be sterile. Care must be taken of the location of the surface because the objects below waist height are not considered sterile. If the inner cover is not in the appropriate direction, when unwrapping it the openings of the gloves will be to far away.
3.		Unfold the inner cover and avoid touching its inner surface or the sterile gloves,	Touching sterile materials with an unsterile hand will contaminate the gloves.
4.		With the thumb and forefinger of the non-dominant hand take the turn-up of the sterile glove then slide the dominant hand into the glove	Only the part of the glove that is the inner of it after putting it on, should be touched
5.		Put on the glove on the dominant hand, only the inner surface of the turn up with the non-dominant hand should be touched	Take care of talc used for lubrication of the inner side of the glove not getting on its outer side because by getting into the stomach cavity it may cause the development of adhesions.
6.	 	Hook the fingers of the gloved (dominant) hand inside the turn-up of the other glove only the outer surface of the glove is touched. Lift the glove, turning the palm towards the individual.	

7.	  	Slip the non-dominant hand into the glove so that at no point does the individual come into contact with the outer surface of the glove and the other hand, either. Meanwhile pull on the glove on the other hand with the dominant hand.	When the turn-up is grasped with the dominant hand, the individual touches the outer surface of the glove so they do not touch the inner surface, which their other hand touches while pulling the glove on it.
8.	 	If it is necessary arrange the gloves on the fingers.	
9.		Fold out the turn-up carefully on the dominant hand (on which the individual first pulled the glove) so that they do not touch the dominant hand with the sterile glove and the inner surface of the glove on it.	
10.		The hands are in sterile gloves and are ready for the medical treatment requiring sterile technology. The individual can touch sterile devices and the prepared operative area.	Do not touch anything with sterile gloves before the operation.

Healthcare waste management

The appropriate management, disposal or recycling of waste created by healthcare is of relevant importance from the point of environmental protection and epidemiology.

On the basis of the data of the World Health Organization (WHO) 8-16 million Hepatitis B virus (HBV)-, 2,3-4,7 million Hepatitis C virus (HCV)- and 80.000-160.000 Human Immunodeficiency Virus (HIV) infections occur annually due to the inappropriate healthcare waste management (the reuse of needles, syringes without sterilization) worldwide, which indicates the outstanding public and national health importance of the issue. The re-use of single-use, disposable devices, which is mainly typical of African, Asian, Middle- and East-European countries, increases the risk of infection.

The recommendations of WHO for public health risk reduction are the following:

In short term:

- syringes should be made of the same plastic because of recycling
- devices free from PVC
- the development of recycling and incinerators
- In intermediate term:the amount of healthcare waste (needles, syringes) should be reduced
- further research in healthcare waste incineration and emission of toxic subtances

In long term:

- improvement of non-burn processes

The objectives of healthcare management include the reduction of the quantity produced, to assure segregated collection and its devices, the formation of appropriate inner routes for transport and working out the possibilities for use, and disposal. According to WHO data out of the waste, created in healthcare, 80 % can be considered commune and 20% hazardous waste (infectious, poisonous, radioactive).

Healthcare waste can be classified into two big groups:

- Municipal (commune) waste
- Waste coming from the healthcare of people, animals or the research related to them (infectious-,hazardous waste on the basis of its chemical components); sharp objects; body parts, organs; infectious waste; chemical and pharmaceutical waste; cytotoxic, cytostatic substances; drugs which are not dangerous; dental amalgam.

The basic rule of health waste management is the availability of the appropriate place of disposal, segregation, the appropriate method following the guidelines.

Waste which can be treated together with municipal waste:

- domestic waste (segregated, collected selectively), non-infectious waste produced in hospital wards, service facilities
- packaging, paper, glass (washed bottles of infusion, too), plastic which is free of dangerous substances
- cartridges of colour ink jet printers and other office equipment, materials (but the paint cartridges of photocopiers are regarded dangerous waste)
- residual waste – food remains, except for left-overs from isolation wards
- garden waste
- disinfected waste

Hazardous waste:

It should be stored separate from other waste, to avoid environmental infection. It is important that medication and their packaging belong to this group, furthermore:

- Chemicals containing or consisting of dangerous substances
- Cytotoxic, cytostatic substances
- Dental amalgam
- Devices containing heavy metals e.g. broken, or damaged mercury thermometers, tensiometers (blood pressure apparatus).

Hazardous (infectious) waste requiring special treatment:

- sharp objects (sharp, pointed devices), which have come into contact with infectious substances, are contaminated, furthermore broken microscopic slides, used pharmaceutical vials (needles, infusion-transfusion accessories).
- human biological substances e.g. blood, blood preparations, body parts, organs, secretion, materials for investigation/ examination left over from medical treatments
- nursing waste (produced after caring for patients)
  - infectious: all the waste produced during the care of an infectious patient in infectious units and isolation wards
  - non-infectious: waste contaminated by non-infectious blood, secretion e.g. bandages, locks, swabs, catheters, nappies (nappies of healthy infants and pads of patients suffering from incontinency temporarily or because of old age can be treated as commune waste)
- microbiological air filters of cleaning devices
- dead bodies (carcasses) and remains of experimental animals comprising of infectious pathogens
- waste from general surgery and microbiology
- substances, devices contaminated by cytostaticum

Recommended practice tools (processes) for the collection and management of certain types of waste:

Process: collection, accumulation → storage → transport → preparation → disposal (treatment)

Hazardous- and infectious waste can be accumulated in the appropriate container until the activity is disturbed (emptying). Containers and bags can be filled just to ¾ part and cannot be more than 10 kg.

Solutions developing and fixing X-ray films should be accumulated separately and passed for getting back silver. Waste containing amalgam must be segregated by filters placed in the drain system, then passed for getting back mercury. Pharmaceutical waste can be disposed only by incineration.

Hazardous waste generated in health care is allowed to accumulate without cooling for 48 hours at the latest until disposal, between 0–5 °C can be stored in refrigerators and used for this special purpose for 30 days. The filled container must not be opened, and you have to make sure it is not accessible to unauthorized people. Incineration is considered to be the preferable method for disposal of infectious waste.

It is forbidden to compact waste before disposal as it can result in the damage of the pack and it can worsen the efficacy of burn essentially.

Picture 33. Egészségügyi hulladék gyűjtésére alkalmas eszközök

Requirements for the tools of hazardous- and infectious waste

Bags:

- Material should be plastic, not PVC
- 0.06 cm thick, yellow
- Maximum 60 l, with string
- Make sure you label appropriately: infectious waste, as well as a label naming the manufacturer of the waste, its type, date, the name of the closer, signature
- Display the international bio danger sign

Sealed containers, boxes:

- material should be plastic, not PVC, or impregnated, with plastic pad
- test fall from 1m height
- needle pin should not stab from 30 cm height
- 5% of it filled with water should stay dry for 24 hours
- its colour yellow, max 60 l
- it should have a max. 20x5 cm throwing-in gap with safety lock in case of storage of sharp objects

Chart 4: Waste management

The Type of Waste	Container	Process of Treatment
Infectious biological waste and sharp objects	Yellow, 0,006 mm thick polyethylene bag with an appropriate sign. Plastic or paper cardboard, stab resistant for sharp devices.	Incineration, steam disinfection, dry thermo-, chemical processes of treatment
Biological waste (non-infectious), body parts, organs	Liquid-compact enclosed plastic bowl (sealed container)	Burial, incineration, crematorium
Experimental animals and their waste	Liquid-compact enclosed plastic bowl (sealed container)	Waste incinerators with permission
Sharp (non-infectious) waste	Re-usable plastic or metal stab (puncture) proof container	Application, incineration after steam disinfection
Chemical-, poisonous-cytotoxic substances	Container suitable for their state of matter (physical condition)	Disposal- dangerous waste incinerators
Radioactive waste (in case of small activity and half-life)	Container suitable for their state of matter after the reduction of activity	Storage, then disposal on the basis of hazard
Other hazardous waste	Container suitable for state of matter	Hazardous waste disposal method
Commune waste	In black, plastic bags preferably segregated, waste must be disposed together with the bag when emptying it	As municipal waste

- it should not be opened after enclosing it without damage
- it must be labelled: infectious waste, as well as a label with the name of the producer of the waste, the type, date, the name of the closer, signature.

Picture 34. Nem éles veszélyes hulladék gyűjtésére használatos zsák

Picture 35. Bioveszély nemzetközi jele

Picture 36. Éles, fertőző hulladék gyűjtésére alkalmas doboz és badella

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18. Personal hygiene care for the sick

BY MÓNIKA KÖBLI, KRISZTINA HOFFMANN, PH.D. JÓZSEF BETLEHEM

Personal hygiene

Personal hygiene is all the healthcare rules concerning the individual allowing for age-group characteristics.This chapter will discuss meeting the individual hygiene needs of patients

Fields of personal hygiene included: care of skin, hair, face (mouth cavity, teeth, eyes, nose, ears), hands, legs, genitalia.

Personal hygiene is a basic human need.

A well-groomed appearance is associated with culture, it is expected of us, by the people around us, and it creates a feeling of well being. Hygienic habits and activities become a form of behaviour through education.

If self-sufficiency is disrupted therefore reducing the individual's ability to maintain their own hygiene needs assistance may be required to satisfy them. In a hospital environment the nurse (nursing assistant, ward nurse) helps to meet these hygiene needs. A group of English and American nurses emphasize the importance of evaluation of nursing tasks. They suggest that certain nursing tasks such as washing and dental care should be done by assistant nurses, so they can spend more time carrying out specialist nursing tasks. However, opponents of this suggestion are afraid of holisticand basic nursing duties being disregarded.

Independent functions of nurses include assessing hygiene needs, and satisfying these on an individual basis..

The assessment has to cover:

- the present state of the patient
- health condition of the patient
- factors disrupting their activity, self-sufficiency
- the degree of the patient's endurance
- primary symptoms
- individual needs
- the physical state of the skin.

The patient's habits, views in connection with washing have to be taken into account when hygiene needs are satisfied. Information on this should be obtained from the patient or his relatives. It would be important to pay attention to the ideal time (for the patient) of washing, bathing and of all hygiene nursing activity. A personalized nursing plan has to be set up primarily for patients who need nursing for a longer time or in acute cases, where 24-hour nursing and several interventions are required. Of course, the protocol of the department and the organisation, as well as up-to-date nursing recommendations should be taken into account.

The order of daily nursing tasks should not meet the nurses' own needs but the patient's comfort and therapy. The patient might be accustomed to evening bathing, which may also facilitate their rest, or bathing may be painful for the patient so they may ask not to be bathed in the morning hours but in the evening, because after that they would rest. In this case analgesia has to be ensured before any painful intervention is made except for occasions when the patient's pain must be observed.

Several nursing protocols allow for satisfying the patient's bathing at anytime of the day. This includes bathing, partial washing, cleansing before and after having a meal, washing hands before and after using the toilet. A possible daily nursing plan can be seen below. It is interesting that a bath is recommended after having breakfast in international protocols as opposed to domestic practice. If it is necessary, it is important to fit in the daily nursing plan the treatment and prevention of symptoms caused by the immobility syndrome, which is discussed in more detail in the chapter called Protection and Safety Requirements Part 2. Maintaining hygiene needs in is influenced by very many factors, which have should be considered by the nurse.

These are the following:

- culture and socialization of the patient
- his personal preferences
- his view and knowledge of hygiene
- his social and financial status
- his religion
- individual pleasures
- his level of development
- his health condition.

Skin

The skin has a significant role in fighting pathogens, noxious substances and radiation, but it has an extremely important role in the sense of feeling, regulating body temperature and excretion also. Characteristics and anatomy of the skin are presented in detail in the chapter called Wound care – Wound management.

The skin requires protection, it has to be made clean of sebum, pathogens and dirt. Good hygiene is important in order to prevent diseases, as the skin is the first protective system against them. Clean skin is important not only in order to prevent infections, but it is an essential condition to well-being and a well-groomed appearance.

During the first meeting with the patient and when physical examinations are carried out, information on the state of the patient's skin can be obtained. To implement this, a well-lit ward of suitable temperature has to be ensured. Actual observation of the patient's skin can be carried out during washing and bathing the patient. It is the nurse's task to look at the skin areas covered by clothes, report any perceived problems to the doctor and take part in the implementation of appropriate treatments. Increased attention has to be paid to the skin care of an overweight patient, because there is an increased inclination for irritation and development of fungoid growth on adjacent skin surfaces and crevices.

A healthy skin is:

- complete and free of injuries
- smooth andsoft,
- flexible and tight.

A sound skin can be endangered by several factors such as:

- nutritional problems
- external impacts (mechanic/ heat effects)
- being bedridden for a long time
- disturbances of bodily fluids and electrolytes management of the body
- functional disturbance of the skin
- disturbances of circulation.

Frequently occurring skin problems include dry skin, greasy skin, appearance of acne, contact dermatitis, hirsutismus (increased hair growth in unusual areas), further skin problems and elemental phenomena of the skin are described in the chapter called Introduction to examination of patients. In hospitals you can see patients whose skin has marks or rashes, itch-mite. Such patients have to have their hygiene taken care of with increased frequency.

When satisfying hygiene needs, the physiological attributes of the skin must be taken into consideration, because age influences the actual state of the skin, hence its care as well.

New-born babies and infants have a sensitive skin, as it is thin and immature. It must not be rubbed hard and abrasion must not occur, because this can cause infections. Soaps that make the skin dry should be avoided.

During adolescence significant changes of the skin occur due to hormonal effects. The intensive functioning of sebaceous glands causes acne to appear mainly on the facial skin, which is a significant problem for adolescents. Increased functioning of the apocrine glands makes it necessary for adolescents to wash frequently and use an antisudorific.

The skin of older people loses some of its flexibility and moisture. Decreased functioning of exocrine glands increases the danger of dry, cracked skin, therefore toiletries that make the skin dry should be avoided.

Skin care

In the course of skin care the patient's feeling of comfort is enhanced, body odour is eliminated, blood circulation is stimulated, and bedsores can be prevented.

Before the patient's bathing/ washing, the nurse also has to assess the factors influencing the choice of washing mode.

The washing mode of the patient is influenced by:

- how active the patient is
- how strong his muscles are
- his wishes
- his coordination ability
- his general state
- the nature of his illness
- his age
- facilities of the hospital
- the doctor's instructions.

The choice of mode of bathing is mostly determined by the actual state of the patient.

- Complete bathing in bed (complete): it has to be used if the patient is unable to be self-sufficient, therefore the nurse has to satisfy his hygiene needs for him. If the patient is incapable of self-sufficiency, he is incapacitated, attention must be paid, apart from complete bathing, to prevention of complications caused by the immobilization syndrome.
- Bathing in bed (partial): it has to be applied when the patient is partially self-sufficient, and only needs help to wash certain body parts. In this case the tools necessary for maintaining their hygiene are prepared by the patient, and help is only provided if it is requested by the patient.
- Bathroom bathing (tub bath), or shower (shower bath): this may be done independently, or with help. Bathing in the bathroom allows for a much thorough washing than bathing in bed.

Bathing, washing the patient in bed

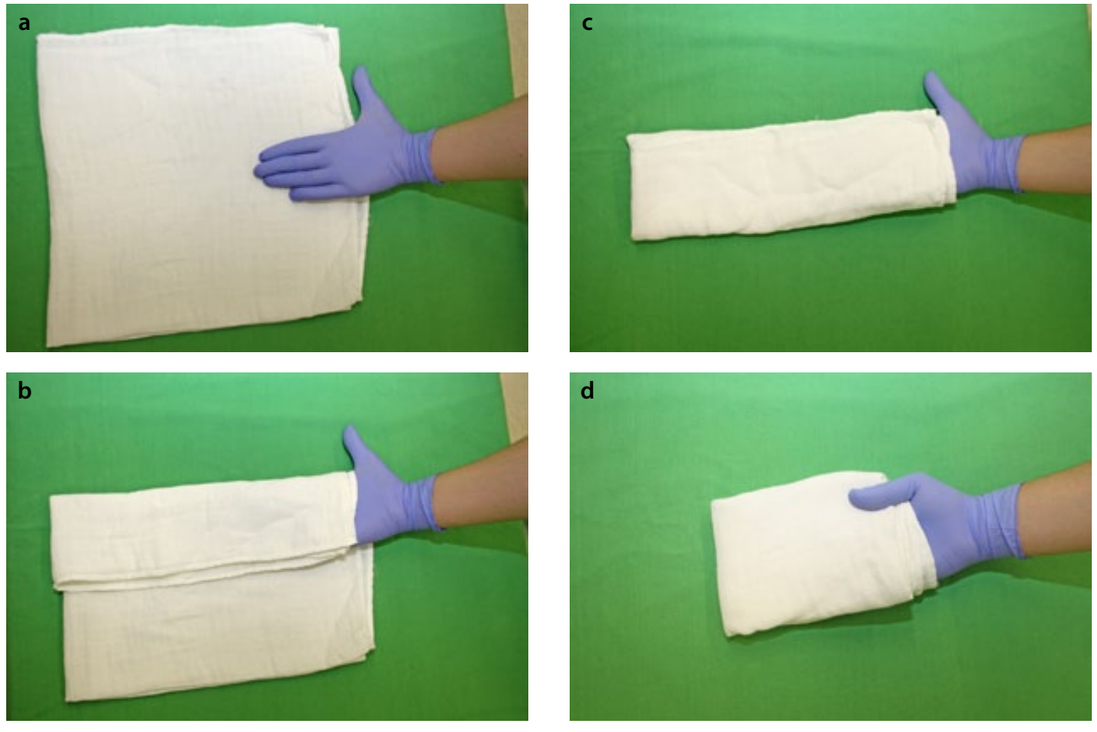
The simplest way of putting together and carrying equipment necessary for washing is the use of a bedding trolley (picture 1), which contains:

- two different coloured towels
- two washing gloves or washing cloths (pictures 2-5) (do not use a sponge because it is hard to dry and germs can establish themselves in it)
- Wash bowl, jug
- Water thermometer

- Shower gel, soap, washing agent for the sick
- Bath towel
- A clean nightgown or pyjamas
- Bed linen
- Laundry basket
- Bedpan, toilet tissue
- Toiletries: washes, deodorants, talcum powders, body lotion
- Rubber gloves.

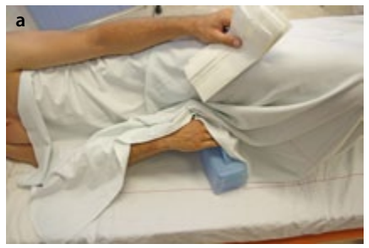
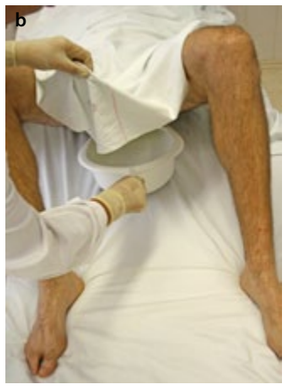
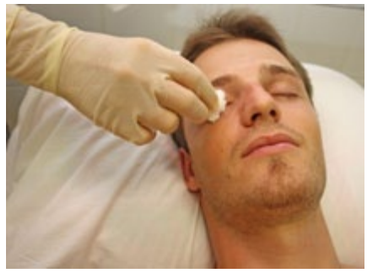
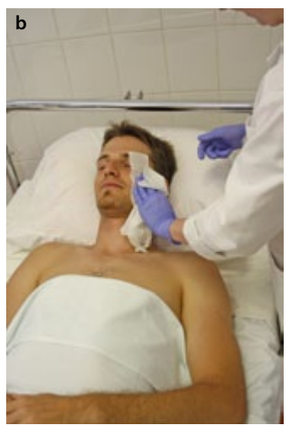
It is not only the toiletries that are important to be prepared, but also the patient, both psychologically (information about the intervention, assessment of needs, setting up a joint plan) and physically (bodily position).

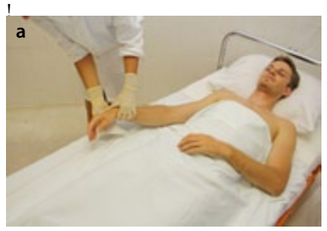
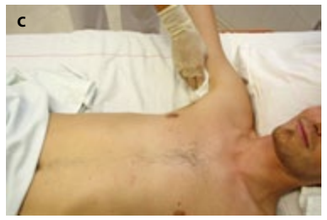
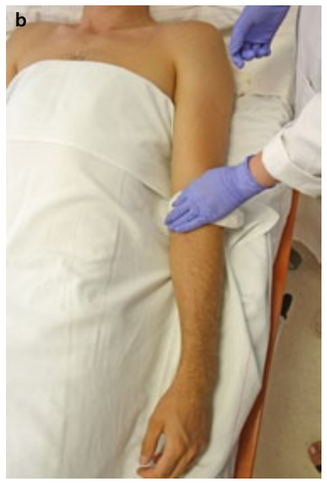
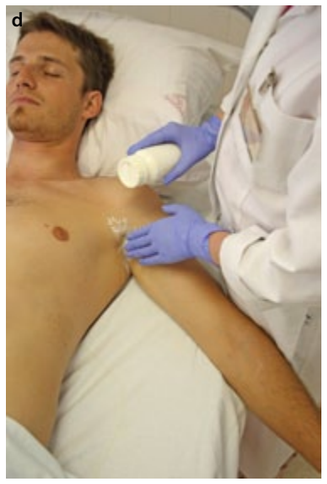
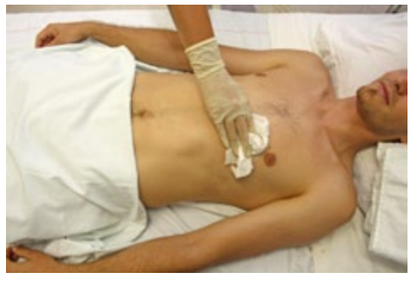
Picture 1. Bedding trolley

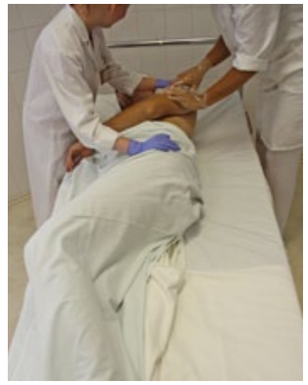
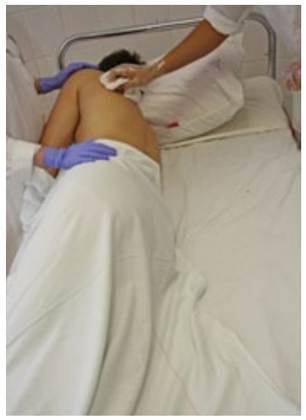
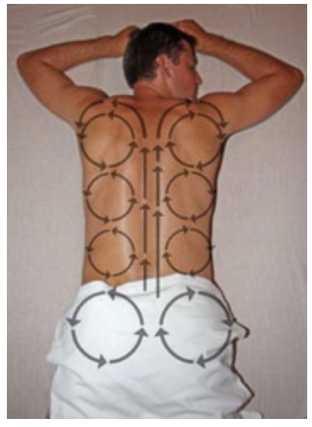


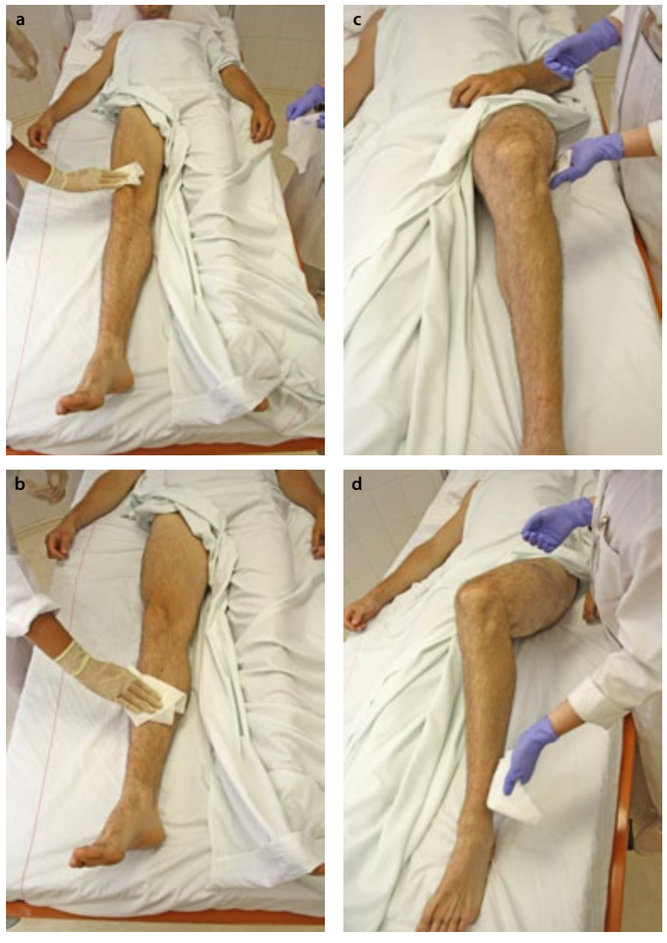
Picture 2. a, b, c, d. Folding a washing cloth

Table 1. Washing, bathing patients in bed

	Steps	Explanation
1.	Carry out hygienic hand sterilization.	Observing the rules of asepsis – antisepsis.
2.	Identify the patient and inform him about the need for and process of intervention.	The patient's fear can be reduced through this, as well as facilitating adequate compliance of the patient.
3.	Prepare the equipment needed for the intervention.	
4.	Ensure the means for toileting for the patient before starting washing *(Pictures 3. a, b).*  	The patient feels better, he will co-operate more easily.
5.	Before starting washing, close the door of the ward, draw the folding screen or curtains if there are any around the bed of the patient. Preparation of the environment includes airing.	Respect the patient's dignity and need for privacy. Start washing when the ward is warm enough again.
6.	Before starting washing, set the patient's bed to a suitable height.	It is easier for the nurse to reach the patient, and it is also more comfortable to carry out washing both for the patient and the nurse.
7.	Help the patient to a comfortable bodily position.	It is easier for him to endure it, and he is more likely to co-operate in the process of washing.
8.	Place the bath towel on the blanket and remove the blanket from under the bath towel.	Removing the blanket prevents it from getting dirty and wet.
9.	Take the nightgown or pyjamas off the patientmaintaining dignity. In case of infusion treatment first remove the nightgown from the free arm of the patient, then after taking off the infusion bottle with the tube draw them through the sleeve of the patient's shirt. After this put the bottle back on the infusion stand. In case of injury remove clothing from uninjured areas first.	Removing clothing from uninjured areas is easier than off the injured one.
10.	Put the warm-water bowl by the patient's bed, and lower the bedrail if there is one.	Removing the bedrail makes it easier to approach the patient. Warm water has pleasant and calming effect.
11.	Put the patient's hand into the water for him to check the temperature of the water, and also use a water thermometer before this, in case the patient cannot sense temperatures due to his illness.	Scalds can be avoided, and the bath water he is accustomed to can be ensured. The ideal temperature is 37°C, but it varies according to individual habits.
12.	Raise the head of the bed to a 35-40-degree angle, then remove the pillow from under the patient's head and place a towel under it.	The bed linen does not get dirty while the patient's face, ears and neck are washed.
13.	Carry out hygienic hand sterilization and put on rubber gloves.	Prevention of nosocomial infections and cross infections, protection of the nurse.
14.	Wash the patient's eye starting from the lesser canthus and working your way to the greater canthus using washing gloves and clean water (picture 4). First soak the dried up, discharging eyes for 3-4 minutes with a wet cloth, then try to remove the discharge. After this wipe both eyes carefully until they are dry.  Following this wash the patient's face with either soap or clean water according to his wish. First the cheeks, then the nose area, after that the forehead, the neck and the ears. If it is not absolutely necessary, do not use rubber gloves to wash the face (pictures 5. a, b)  	Soap burns the eyes. The discharge mostly accummulates in the greater canthus, which should not be wiped all through the eye. Washes with soap or shower gel always have to be rinsed in clean water, because the skin gets dry and injuries can develop.

15.	Place the patient's hand that is near the nurse in the wash bowl, put a towel under the arm. Wash the patient's arm firmly working up from the fingers to the armpit using soap or shower gel. Then rinse it in clean water and wipe it dry with increased attention to the armpit area. If the patient requests it, use a deodorant or talcum powder. Pay attention to cleaning the nails, too! (pictures 16. a, b, c, d,) !    	The hand placed in the wash bowl means refreshment for the patient, it increases the sense of bathing in a tub. It is not hygienic to smear the discharge produced by the exocrine glands onto the arms.
16.	Raise the bedrail, then lower the bedrail on the other side and wash the other arm according to the foregoing. But before that the temperature of the water must be checked. If it is cold, or very soapy or dirty, the water must be changed.	By raising the bedrail, the patient's sense of safety is increased. It is expedient to carry out bathing of the patient only if the water temperature and cleanliness are adequate.
17.	When washing the chest raise only one corner of the towel which is put on the patient, and wash the patient's chest and abdomen. Pay attention to the area below the breast in case of female patients. Pay special attention to the navel and abdominal curves. Check during washing whether the patient has observable skin alteration in the chest and abdominal area.  Wash with soap or shower gel, then rinse the cleaned parts, and dry the skin. It may happen that the patient's navel is contaminated, try to clean this with oily cotton wool. (picture 7)	Do not expose the patient unnecessarily. Wet, damp skin surface causes the skin to be sodden and chapped. Observed skin alterations have to be treated according to the doctor's instructions..

18.	Carefully roll the patient to his side or abdomen if it is more comfortable for him, then cover him with a bath towel from shoulders to thighs (picture 16).   Raising one corner of the towel wash the neck and the back thoroughly, then dry them (picture 8). During washing or after it massage the back and the shoulders (picture 9).  But the patient must be asked first if he wants this or not, and information must be obtained whether there is contraindication in connection with this. Make sure your nails are short and blunt during massage and bathing. Apply long, superficial strokes, circular movements, and kneading and twisting massages. Remember to warm the body lotion, which can be done properly by soaking it in warm water. A microwave oven must not be used for warming it up! Avoid using agents that contain alcohol because they may make the skin dry, use body lotions and massage oils instead. Damaged skin surface must not be rubbed or given a massage because it may cause further damage to the skin.	More details about the techniques of rolling to the side can be read in the chapter called Protection and safety requirements Part 2. For better circulation and refreshment. Injuries to the patient are caused to a lesser degree if nails are cut short. Further massage techniques to increase circulation can be read about in the chapter called Protection and safety requirements Part 1.
19.	When washing the sacral area pay attention to the state of the buttock creases and rectum area. Wash them, then dry them.	It is a bony area, it needs thorough attention in order to see bed-sores in time. The rectum area may be increasingly contaminated.
20.	Roll the patient to his back and cover him with a bath towel. Raise the bedrail and change the water. Water can be changed earlier too if it gets cold or very dirty.	Make sure the patient's need for privacy and his safety needs are respected.

21.	Remove the bedrail, make the patient check the water temperature (if he is able to do it), then put a towel under the patient's feet, and put his feet into the wash bowl. Start washing the legs from the thighs, and finish with feet and toes (pictures 11. a, b, c, d). Dry them and pay attention to drying the parts between the toes. If it is necessary, talcum powder can be applied. Nails get soft while being soaked, so it is easier to clip them. If you have time, you can clean the nails during washing. Nails on the toes have to be cut straight, on fingers they should be rounded similarly to the shape to the fingertips. It is better to arrange for a specialist (therapeutic chiropodist) to clip the nails of diabetic patients.  	The patient's feet should be soaked in order to make nails soft and ensure a better feeling. The wet area between the toes may easily cause fungous infection to develop. It is very hard for injuries to diabetic feet to heal, or they do not heal at all due to the deterioration of circulation.
22.	Raise the bedrail and carry out washing the leg on the other side according to the foregoing.	

Pictures 3–11 Washing, bathing the patient in bed using washing towels

23.	Cover the patient with a bath towel, raise the bedrail, and change water. Prepare water that is of body temperature in a jug, and place bed protection and a bedpan under the patient. Ask the patient to pull up his knees (if he can), or help him to this bodily position. Pour a little water onto the inside surface of the thigh. Wash the genitals with a lot of water, soap, pay attention to the curves. Soap has to be rinsed with water poured from the jug above the bedpan, then dry the genitals carefully working from the front to the back. Use talcum powder on the creases if you see that it is necessary. Paper tissue can be used in case of menstruation. Take the bedpan from under the patient, and ensure their comfort.	Whether the temperature of the water is suitable for the patient can be checked by pouring a little from the jug. The areas in the creases can become chapped easily. When washing the genitals germs should not get on the genitals from the rectal area. The bedpan should not be under the patient for a long time in order to avoid skin injuries.
24.	Help to put on the nightgown or pyjamas, and replace bed linen. The process can be found in the chapter called Protection and safety requirements Part 2. Pay attention to the patient's safety needs and need for privacy.	The patient feels well due to his clean pyjamas and bed linen.
25.	Apply body lotion according to the patient's request.	Due to this, dry skin and injuries can be avoided.
26.	Ensure the patient's comfort.	
27.	Clean the equipment used in bathing and put them in their places. It is highly important to clean and sterilize the wash bowl thoroughly.	In order to prevent infections.
28.	Carry out hygienic hand sterilization.	It reduces the risk of transferring pathogens.
29.	Document the intervention: time (day, hour) of the intervention, name and title of the persons carrying out the intervention, vital parameters (before, during and after the examination), change in the condition of the patient during and after the intervention. If there is an injury, skin damage, report it to the doctor.	All care given should be documented within the patient's records.

In some cases the order of bathing has to be changed. For example the contaminated part of the body in incontinent patients is washed first, and then the washing of other body partsfollows. It would be inappropriate to leave the patient on the contaminated sheet, and turn him on it.

Bathing in bathroom (shower and tub)

The patient can have a bath in the bathroom with help or alone. Equipment and assisting staff have to be ensured even if the patient has a bath by himself. Even incapacitated patients can be bathed in the bathroom on special bath beds made for this purpose (picture 44), it is much easier to wash the patients, and it is more refreshing for them as well. The correct way of raising the patient and using the equipment are detailed in the chapter called Protection and safety requirements Part 1.

Table 2. Bathing in bathroom

	Steps	Explanation
1.	Carry out hygienic hand sterilization.	Observing the rules of asepsis-antisepsis.
2.	Identify the patient and inform him about the need for and process of intervention.	The patient's fear can be lessened through this, as well as adequate compliance of the patient can be facilitated.
3.	Check the cleanliness of the bathtub or shower tray. They have to be cleaned and sterilized before and after each bath or shower. After this place anti-slides in the bath or shower tray and in front of them.	Transfer of infections from one patient to the other can be avoided through cleaning. Accidents can be prevented by the use of anti-slides.

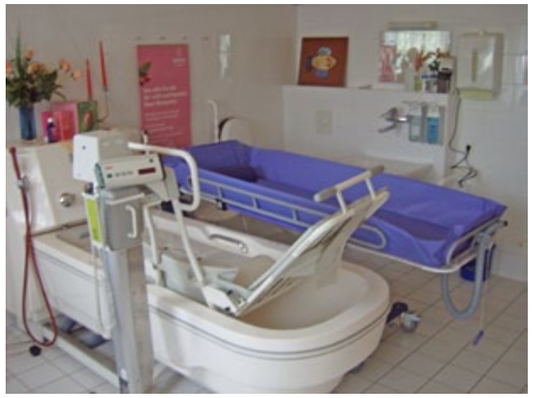
4.	Ensure suitable temperature, close the windows and doors, and put the equipment needed for cleaning within easy reach. Put the sign 'Reserved' on the door of the bathroom.	The suitable temperature is ensured in order to avoid colds. Easy reach of equipment reduces the possibility of slipping, falling. Placing the sign creates intimate, undisturbed circumstances for the patient.
5.	Help the patient to bath if it is necessary. Escort him from the ward to the bathroom, help him to undress and get into the tub by supporting him in the armpit or placing a chair near the tub, then make the patient sit from the chair onto the edge of the tub, putting first his legs into the tub, then his whole body. You can apply a patient raiser, bath lift.	It is safe for the patient, accidents can be prevented.
6.	If the patient has a bath by himself, show him which the hot-water tap is. If he needs help, turn on the tap, check the temperature of the water with a water thermometer. Ask the patient if he is pleased with the temperature of the water.	In order to prevent scalds.
7.	Explain to the patient how he can hold on and step in the tub safely if he has a bath by himself. Call attention the the calling system if it is available in the particular department. Do not use bath oils in the tub, and call the patient's attention to that too!	In order to prevent accidents. The patient can immediately call for help if he feels unwell. Oil increases the risk of slipping.
8.	If the patient has a bath by himself, tell him not to have the bath or shower for longer than 20 minutes, and check the patient every 5 minutes after knocking on the door.	Vasodilatation, bloodstagnation and due to this collapse can be caused by a long hot bath.
9.	With the patient's consent, wash the areas that are difficult for him to reach. After finishing the bath, help the patient to step out of the tub or shower tray and to get dressed. Escort the patient to the ward, help him to a comfortable bodily position.	In order to prevent accidents.
10.	Report the observed skin alterations to the doctor, participate in the necessary treatment (either independently or co-operating). If the patient has had the bath independently, check his general state and adequacy of washing.	In order to treat the damaged skin and prevent deterioration of existing skin alteration. Be considerate with elderly patients whose washing is inadequate due to their age.
11.	Clean the tub, shower tray, put the laundry in the laundry chute, put the washing equipment in their place.	Transfer of infections can be hindered.
12.	Carry out hygienic hand sterilization.	
13.	Document the intervention: time (day, hour) of the intervention, name and title of the persons carrying out the intervention, vital parameters (before, during and after the examination), changes in the condition of the patient during and after the intervention. If there is an injury, skin damage, report it to the doctor.	All care given should be documented within the patient's records.

Picture 12. Bath bed

Picture 13. Patient raiser

Equipment needed (picture 14):

- Buzzer near the bath or shower booth
- Anti-slides in the shower, bath and in front of them
- Handrails
- Patient raiser lift
- Waterproof chair for implementation of safer bathing
- Waterproof protective clothes for the nurse
- Waterproof straps by which the patient can be fixed in the shower, in this way he does not fall when he slips



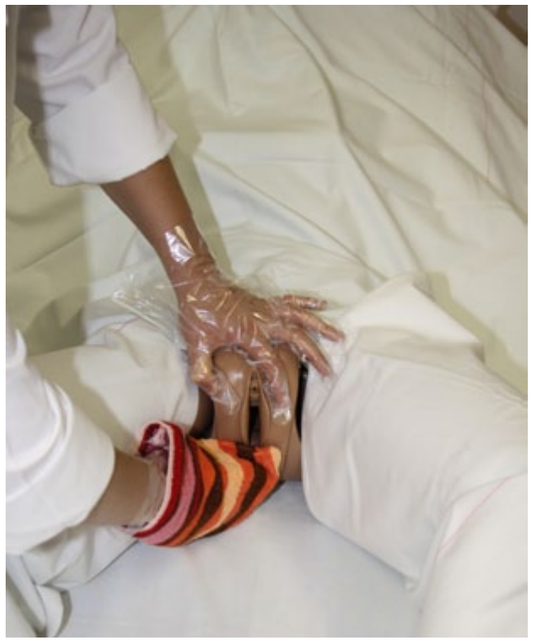
Picture 14. Bathroom and equipment

Assisting staff:

In case of bathing independently, the nurse should beable to be contacted immediately if the patient needs them.

Nursing of the perineal area

Care of the perineal area can be considered part ofmaintaining hygiene needs. If there is an increased risk of infection for the patient, more care may be required in this area. These dangers can cause significant problems mainly during catheterization, after rectal and genital operations, for women af-



Picture 15. Perineal care

ter giving birth. Perineal care must be done several times a day during menstruation, because there is reduced resistance to infections. Women are likely to be more irritable then, they have reduced endurance and tolerance, therefore a good patient-nurse relationship should be facilitated through circumspect nursing. If it is requested, it may be necessary to relieve pain and cramps.

Make sure the ward is of suitable temperature and equipment ensuring privacy (folding screen, curtains) is available.

Nail (hand) and leg care

The importance of washing hands should not be underestimated. Washing and adequate cleansing of the hands of the healthcare staff have a crucial role in preventing the spread of infections. It has to be made possible for the patients as well to wash and sterilize their hands even if their self-sufficiency is disrupted.

Nails

Nails are parts of the skin. They are of epithelium origin, growing from the nail-bed, covering the end of the fingers. Healthy nails are typically:

- transparent
- the nail-beds are pink
- their surface is smooth and convex.

There are diseases which change the shape, thickness and bend of nails. Nurses should thererfore pay attention to the state of a patient's nails.

Nail problems that may occur:

- hooked or crooked nails
- ingrowing nails
- injuries to nails
- brittle nails
- thickened nails
- fungal nails
- skin inflammation around nails (paronychia)

These problems need special care. It is useful to ask a chiropodist to help. Pay attention also to the states that increase the development of nail and foot problems. Such states are: old age, diabetes, cardio-vascular diseases, renal diseases. Nail care is often done when washing the patient.

Prepare the tools needed for nail care:

- wash bowl
- washing gloves or washing cloth (do not use a sponge because it is hard to dry and germs can establish themselves in it)
- soap or shower gel
- towel
- nail clippers
- nail cleaners
- nail file
- rubber gloves
- emollient
- spray, talcum powder
- paper towels
- nail brush.

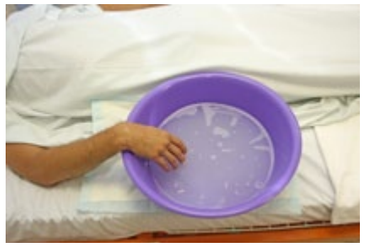
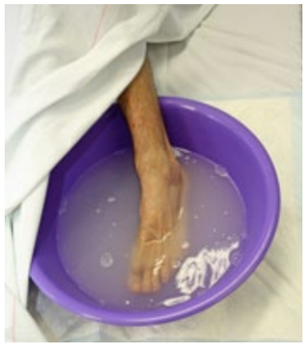
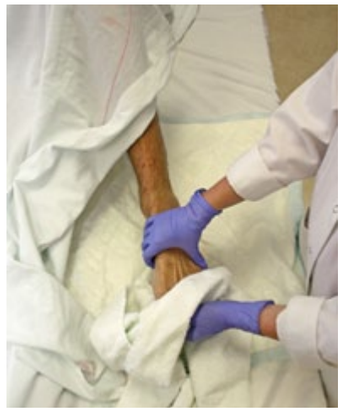
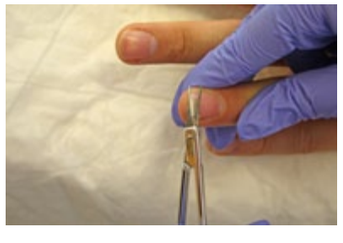
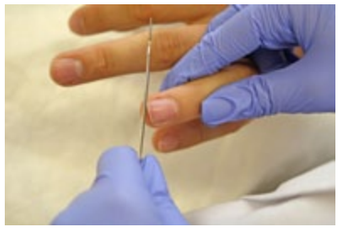
There may be alterations on the feet as well which need circumspect care. Observe the alterations during foot care, to which the attention of the doctor, the patient and the family has to be called. If the character of the alteration justifies it, involve other specialists (dermatologist) in the treatment.

Frequent problems:

- calluses, corns
- warts
- fungal infections on the feet, foot odour.

By soaking the feet not only nails become soft but also the skin and the horn.

Table 3. A kéz és a láb körmének ápolása

	Steps	Explanation
1.	Carry out hygienic hand sterilization.	Observing the rules of asepsis-antisepsis.
2.	Identify the patient, and inform him about the need for and process of intervention.	The patient's fear can be lessened through this, as well as adequate compliance of the patient can be facilitated.
3.	If washing and nail care are done together, place the hands and feet in the wash bowl used for washing. If there is no time for nail care when washing, it has to be done some other time during the day.	Apart from comfort it makes it possible for the nails to soften, through this they are more easily cared for.
4.	Ensure suitable temperature, close the windows and doors, and put the equipment needed for cleaning within easy reach. Put the sign 'Reserved' on the door of the bathroom.	If the patient is sitting, it is easier for him to place his legs in the wash bowl.
5.	Place the hands and feet in warm, slightly soapy water for about 10-20 minutes. The temperature of the water must be checked (pictures 16 and 18–21).  	The nails soften, so they can be cared for more easily.
6.	Put on rubber gloves and clean the nails with a nail cleaner (brush), remove dirt, then remove the wash basin, and dry the patient's hands and feet (pictures 17., 18., 22., 23.)    	Having neat nails include having clean nails. It is essential to dry toes in order to prevent fungal infections.
7.	Cut softened nails with scissors suitable for nail clipping. Most men use nail clips, most women use a nail file to care for their nails (pictures 19., 20.).  	

8.	Toenails must be cut parallel to the toe ends. Do not make the edges rounded, shape them with a nail file (pictures 24., 25.)  	In this way ingrowing nails can be hindered, which may irritate the area near the nails.
9.	Rely on a specialist (therapeutical chiropodist) to do toenail care for diabetic patients.	Any minor injuries can be caused, which do not heal or hardly heal due to bad blood circulation.
10.	After cutting, nails should be soaked again and then dried, then hand and foot creams have to be applied.	
11.	After the intervention clean, sterilize and put the equipment used back in its place.	
12.	Carry out hygienic hand sterilization.	In order to prevent spread of infections.
13.	Document the intervention: time (day, hour) of the intervention, name and title of the persons carrying out the intervention, vital parameters (before, during and after the examination), change in the condition of the patient during and after the intervention. If there is an injury, skin damage, report it to the doctor.	All care given should be documented within the patient's records.

Mouth care

Mouth hygiene serves healthy oral cavity, teeth, gums, and lips. It ensures cleanliness and well-being. Frequent mouth problems may be caries (tooth decay), stomatitis (inflammation inside the oral cavity), glossitis (inflammation of the tongue), gingivitis (inflammation of the gums), halitosis (bad breath), cheilosis (cracked lips), malignant alterations, ulcers, herpes simplex.

Other factors contributing to damage to the mucous membrane of the mouth:

- sour food
- medicines
- broken teeth and tooth erosion
- misaligned dentures
- inappropriate nutrition
- dehydration
- mouth breathing
- decreased salivary secretion
- insufficient mouth care.

If the patient has his own teeth, he can carry out regular dental care on his own, or with help (pictures 61-63). You have to find out about the tooth brushing habits of the patient. It is most optimal if the patient carries out mouth and dental care after every meal.

Preparation for tooth brushing:

- a toothbrush (traditional or electric)
- toothpaste
- dental floss
- a toothbrushing cup
- mouthwash
- a kidney bowl
- paper towel
- gauze pads
- rubber gloves
- a towel.

If the patient has a removable denture, you should place it in a covered storebox, which has been filled up with denture cleaning solution. After removing the denture, the nurse should look at the patient's mouth cavity. As many people feel uncomfortable without their denture, ensure privacy.



Pictures 26. a, b, c. Brushing teeth in bed

Hair care

Hair care is a basic hygiene need of every person.

Hair

It produces sebum which has to be removed. Combing the hair facilitates better circulation of the scalp and removal of dust and contaminants. Hair matting can be prevented by regular hair care.

Problems of the hair and scalp can be:

- Lice (make sure other patients do not get infected, treat it immediately)
- Dandruff
- Lack of hair (alopecia)
- Increased loss of hair
- Brittle hair
- Cradle cap
- Seborrhoeic dermatitis.

Hair care

Start combing long, dishevelled hair from the tips. Hold long hair together so that it does not press the nape. It is useful to braid it so that the patient's hair can get less tangled. (The patient's consent is needed for that.) The patient should not wear hair clips or pins in bed, which may cause injuries.

It is very important to recognize hair lice (pediculosis capitis), because other patients and the healthcare staff can easily get infected.

Washing Hair

Hair has to be washed as often as the patient requests it. There are conditions which make it necessary to wash the hair more frequently: temperature, sweating, prolonged bedrest etc. If the patient can get out of bed, they can wash their hair by the tap or in the shower on their own or with some help. If the patient lies in bed incapacitated, their hair needs to be washed and cared for in bed.

The necessary equipment has to be prepared:

- Wash bowl, if possible, a hairwash bowl with outflow (picture 27)
- Bucket
- Towel
- Jugs with water of body temperature
- Shampoo
- Conditioner
- 2 large-sized rubber sheets
- 2 drawsheets
- Rubber gloves
- Hair brush and comb
- Hair dryer
- Cotton wool, gauze.

Table 27. Hair wash equipment

Table 4. Washing Hair

	Steps	Explanation
1.	Carry out hygienic hand sterilization.	Observing the rules of asepsis-antisepsis.
2.	Identify the patient, and inform him about the need for and process of intervention.	The patient's fear can be lessened through this, as well as adequate compliance of the patient can be facilitated.
3.	Place the patient so his head is near the edge of the bed.	The patient can be reached easily, and it is easier to carry out the intervention.
4.	Place a rubber sheet under the head in a way that, being formed into a funnel, it can be put into the bucket placed on a chair near the sickbed.	
5.	Form a cape collar around the neck of the patient from a textile sheet placed on the rubber sheet, which has to be pinned together on the front.	The rubber sheet and the patient's skin should not touch.
6.	Pour the water from the jug slowly on the hair of the patient.	
7.	Rub the patient's hair with shampoo carefully.	In order to avoid injuries.
8.	Rinse, then cover the hair with a towel for the water to be soaked up, and dry the hair.	Do not leave shampoo on the hair. By drying the hair quickly colds can be prevented.
9.	Ask the patient if he is satisfied with his hair style	Patient satisfaction is increased.
10.	Help the patient into a comfortable position.	Increase in comfort.
11.	Put the equipment back in its place.	
12.	Carry out hygienic hand sterilization.	In order to prevent the transfer of infections.
13.	Document the intervention: time (day, hour) of the intervention, name and title of the persons carrying out the intervention, vital parameters (before, during and after the examination), change in the condition of the patient during and after the intervention. If there is an injury, skin damage, report it to the doctor.	All care given should be documented within the patient's records.

If there is no hair wash equipment available, the patient's hair can be washed in the traditional way using rubber sheets.

Shaving:

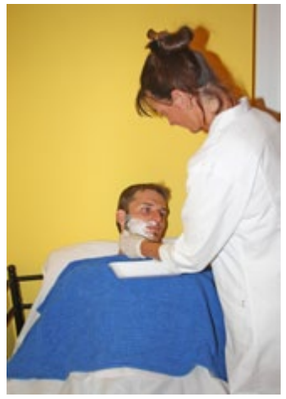
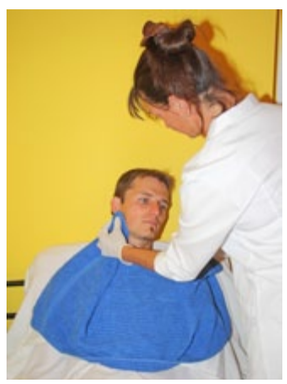
Facial hair should be shaved after bathing. With female patients, leg and armpit hair should be removed during bathing. The skin has to be softened before using a razor, and make sure that injuries are not caused. If a male patient is able to shave on his own but he cannot leave the bed, the nurse only assists by preparing the equipment, but he should do the intervention himself (picture 76). Help the patient into a sitting position, or raise the bedhead, and make sure there is enough light to carry out the intervention.

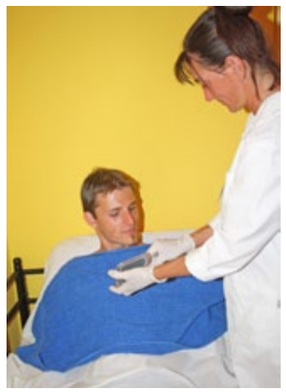
Preparation of equipment for shaving:

- wash bowl with warm water
- the patient's own razor (blade or electric)
- shaving foam
- shaving oil
- towel
- after shave lotion, skin care products (vitamin E, aloe vera)
- mirror
- rubber gloves.

Picture 28. The patient is shaving on his own

Table 5 Shaving

	Steps	Explanation
1.	Carry out hygienic hand sterilization.	Observing the rules of asepsis-antisepsis.
2.	Identify the patient, and inform him about the need for and process of intervention.	The patient's fear can be lessened through this, as well as adequate compliance of the patient can be facilitated.
3.	Prepare the equipment needed for the intervention.	
4.	Put on the rubber gloves.	
5.	Shave carefully if you use a razor.	The lumbar region is a very vulnerable area.
6.	Moisten the area to be shaved before starting to shave.	A few minutes of warm wet soaking makes the skin and follicles soften.
7.	Use shaving foam, creams, gels instead of soap. Shaving oils can be applied too, which help the razor to slide more easily on the skin.	They make the area softer. Soap is less foamy and it may irritate and dry the skin. This will prevent the burning feeling after shaving and skin irritation.
8.	Use a disposable razor. Stretch the skin taut while shaving (picture 29) 	In order to prevent infections. Shaving creased skin cannot be done.
9.	Rinse the razor several times.	It is difficult to remove hair with a clogged razor.
10.	After shaving wash the area with plenty of water, then dry it (picture 30). 	Check the washed and shaved area for injuries.
11.	Apply moisturizing substances on the shaven lumbar region (vitamin E, aloe vera).	They soothe the skin, through their application skin irritation can be prevented.

12.	You may show the shaven area to the patient using a mirror, and ask if he is satisfied with it (picture 31). 	Patient satisfaction is increased.
13.	Tidy up the patient's environment.	
14.	Treat the waste generated selectively.	
15.	Carry out hygienic hand sterilization.	
16.	Document the intervention.	All care given should be documented within the patient's records.

Eye care

Special care of the eyes should be taken especially with unconscious patients. The eyes of some unconscious patients may be open, which may lead to dry eyes.

Discharge often builds up in the corner, its removal is the duty of the nurse.

During care, it is useful to place a wet gauze pad on the eye in order to prevent drying, but eye drops and artificial tears can also be used to treat these problems.

Patients with an inflammation of the eyes also need special eye care.

Always pay attention to using clean water to wash the eyes because soapy wash may irritate the eyes. Eye drops and creams prescribed by the doctor should be used in case of inflamed eyes. Eye care always has to be done working your way from the inner corner to the outer corner (infection of the tear-duct can be prevented).

Ear care

Outer auditory meatus can be cleaned with a clean wipe cloth during washing. You can try removing cerumen with oily cotton balls, do not use a sharp object to remove it in any case. It is advantegous to use a spray, which makes it possible to remove dried up cerumen.

Nose care

If the patient is unable to remove nasal discharge, the nurse has to help them. The nurse can apply a wet wash cloth or a swab with its end wrapped in cotton wool which has been moisturised in water or salty solution, but it should not be pushed deep into the nose. Oily cotton balls can also be used to remove discharge. It is useful to use suction to remove a greater amount of nasal discharge. Pay attention to the integrity of the skin around the nose and the mucous membrane.

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19. The Need for Sleep and Rest

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Sleep and rest have an important role in human health. Rest contributes to the regeneration, restoration of the body, therefore ensuring adequate rest is especially important for patients.

Adequate rest is influenced by several factors which contribute to physical comfort: the sickbed, the ward environment (noise, lighting, temperature), pain, sense of safety, personal hygiene, comfortable body position. Further influencing factors can be seen in Table 2 of the chapter. The ward environment and sleeping position – sleeping positions are discussed in more detail in the chapter called Protection and safety needs I. Personal hygiene is presented in detail in the chapter called Personal hygiene care for the sick.

There are several methods to facilitate sleep and rest: massage, ensuring a safe environment, satisfying hygienic needs (hot-water bath), not drinking coffee during the hours before going to sleep, giving hot milk to the patient, keeping patients active, encourage movement, pleasant soft music, relaxation exercises, and safe hypnosis. Medicines should only be applied after these methods have proved ineffective. Further exercises that help to go to sleep and sleep through the night can be acquired in the subpart of the chapter about falling asleep and going back to sleep.

Picture 1. Alvó csecsemő

Of sleeping, rest Concepts

Rest

The state when the individual gets into a physically and mentally relaxed state.

Sleeping *(picture 1)*

Sleep is a basic need, and it is characterized by a modified mental state (blocked consciousness, mental break-away from the environment). Physical and mental tiredness which you get during wakefulness can be eliminated through sleep.

Rest

two forms are differentiated, active and passive rest. During rest the individual eliminates his physical and mental tiredness, reduces it, facilitates his regeneration, and restores his endurance. There are people who feel refreshed after a fifteen-minute rest, but others may need more time.

Active rest

the individual pursues an activity which is different from their usual activity. In the course of active rest, the body or the brain have a rest according to the type of the particular activity (e.g. the person who does physical work during most of the day needs to do some mental activity, and those who do intellectual work need physical exercise as a form of relaxation.

Passive rest

The body gets relaxed, metabolism, breathing, circulation slow down, the individual sleeps or sits in a chair, lies in bed calmly and relaxed. They often reads or do needlework. To ensure rest, a calm and quiet environment is needed. Bed-rest is prescribed by the doctor in certain clinical pictures, because it is a necessary state for the regeneration of the body and for the prevention of further damage to it. Bed-rest is discussed in detail in the chapter called Protection and safety needs I.

Diurnal (circadian) cycle

a twenty-four-hour cycle which is based on changes in light and temperature, but it is not necessarily a simple response to that. It determines the individual's sleep – wakefulness cycle, and connected to that, changes in their vital parameters, hormone excretion, mood, occupational and social factors.

Infradian cycle

cycles longer than 24 hours (menstruation).

Ultradian cycle

cycles shorter than 24 hours (periods of tiredness).

Sleep also has cycles. These sleep cycles have to be taken into account in order to ensure adequate sleep for the patient. The individual's sleeping habits can adapt to their occupation, the season or other somatic functions (e.g. on average we sleep more in autumn than in spring).

Sleep need

The amount of sleep needed varies from individual to individual. The need is influenced by several factors: age, general health condition, other factors include pregnancy.

A person's need for sleep can be determined by measuring the time from going to bed to waking up without an alarm clock, with sleep being undisturbed. This has to be observed through several days, and the time needed to fall asleep (an average of 20-30 minutes) has to be deducted from the received value. In addition to the need for sleep, the patient's sleeping habits have to be examined.

This should cover the following:

- The quality of sleep has to be assessed by the patient on a numeric scale of 1 – 10 (10 – relaxed, refreshed)
- Examining sleeping habits (body position, use of bedlinen, the amount and size of pillows)
- The usual time of falling asleep and awakening
- The time needed for falling asleep
- The time needed for getting up after waking up
- The time spent in bed and the time spent sleeping
- Difficulties to fall asleep or possibly to sleep through the night
- Number, length, possible cause of waking up
- Factors needed to fall asleep: hot milk, watching television, playing the radio low, medicines
- The amount of daytime naps
- The degree of tiredness, ability to concentrate during the day
- Touch on symptoms characteristic of sleep disorders (see in the subpart Frequent sleep disorders).

Stages of sleep

In order to break down sleep into stages, it is necessary to apply several diagnostic imaging tools jointly: EEG (electroencephalogram), EOG (electrooculogram), EMG (electromyogram), furthermore, the polysomnograph is used to differentiate the stages.

Sleep can be divided into two main stages, the stage of rapid eye movement (REM), which accounts for 25% of sleep, and the stage of non-rapid eye movement (non-REM) which ensures 75% in case of healthy adults. A sleep cycle lasts 70 – 100 minutes, and it is repeated roughly four or five times a night.

Non-REM

Metabolism, breathing and circulation diminish at this stage as a result of parasympathetic dominance. Muscles relax, bones and cells begin to grow and regenerate. Most of the proteins synthetize at the non-REM stage as well.

Four depths of this stage are differentiated, but a so-called 0 stage is also mentioned which covers the time needed for falling asleep (20–30 minutes).

- stage (the state between wakefulness and sleep, slumber): vital parameters and perception diminish, muscles relax. The person can easily be awakened at this stage, and slow (swimming) eye movement can be observed.
- stage (beginning of sleep, superficial sleep): eye movement cannot be observed any more, but the person can still be awakened easily.
- stage (transition from superficial sleep to deep sleep): at this stage the sleeper may move and speak, and the dominance of parasympathetic nervous system can be observed, it is hard to awaken him already at this stage.
- stage (deep sleep): it is difficult to awaken the the person sleeping, movement can be observed rarely, and vital functions decrease by roughly 30 % in comparison to the state of wakefulness. GH (the growth hormone) is produced to the greatest degree at this stage. Dreaming in this stage can occur, but these dreams are not remembered by the person. Bedwetting and sleepwalking happen most often at this stage. Stage 4 is not immediately followed by the REM stage, the cycle goes back to stage 2 of non-REM stage, and only after that, does it enter the REM stage.

During the first half of the night non-REM stages are longer, while in the early morning hours longer REM stages can be observed.

REM

We process what has happened tous during the day at the REM phase in the form of dreaming. In effect where dreams occur, the sympathetic nervous system starts to function, as a result of which the circulatory and respiratory systems work faster. Movement of muscles and the release of adrenaline hormone can be observed. More REM is required in this phase of sleep after stress or learning so that the brain can recover after intellectual tiredness.

The length of the REM stage can be very varied, it ranges from 5 to 30 minutes. After this Stage 2 of non-REM returns once more.

Frequent sleep disorders

The need for sleep and the sleeping habits of patients are changed by the hospital environment or their illness. It is important to assess and treat sleep disorders, because adequate rest contributes to recovery. The states which disrupts the individual's sleeping order are generally called sleep disorders.

The classification of sleep disorders according to the American Academy of Sleep Medicine(ref):

- Insomnias
- Sleep-related breathing disorders
- Hypersomnias
- Circadian rhythm-related sleep disorders
- Parasomnias
- Sleep-related movement disorders
- Apparent normal variants, isolated symptoms, unresolved issues
- Other sleep disorders

Dyssomnia

all clinical pictures that include symptoms of insomnias and parasomnias as well.

Parasomnia

unwanted clinical pictures which primarily occur during sleep.

Dyssomnias

Insomnia

Quantitative or qualitative disorder of sleep (difficulty falling asleep, maintaining sleep for insufficient time, problems with sleeping through). Insomnia can be a result of anxiety, worry, fear, hyperactivity, mental illnesses, apnoe, hospitalization, cough, itch, frequent need to urinate, a lot of drinks which contain caffeine, pain. (Further factors influencing sleep are summarized in Table 2.)

Insomnia can be noticed by the characteristic symptoms or the patient may speak about it: tiredness when waking up or during the whole day, naps during the day, yawning, mood swings, irritation, reduced attention and ability to concentrate, deteriorating performance and memory, accidents, reduced energy level, and appearance of other somatic symptoms (headache, diseases of the digestive system).

Children's insomnia is caused by fear, difficulties to retain urine at night, getting accustomed to sleeping with parents, waking up frequently.

The classification of insomnia depends on triggering causes, length of disorder.

Transient, short-term and chronic forms are differentiated depending on how long the disorder lasts.

- ***Transient:*** insomnia occurs once or twice.
- ***Short-term:*** insomnia is typical of life, perhaps when there are stressful periods, it lasts for a few weeks, and after the problems have resolved it disappears.
- ***Chronic:*** insomnia may relate to certain diseases and it lasts for at least 3 months uninterrupted.

Insomnia can also be classified according to the triggering cause.

- ***Primary:*** the type of insomnia which cannot be traced back to other causes.
- ***Secondary:*** the insomnia can be traced back to some triggering cause.

Treatment of insomnia depends on any trigger factors. If we know the cause of any triggers (secondary insomnia), we treat the underlying illness. In addition to treating the underlying illness, non-medical therapies should be applied (the techniques are included in the subpart about falling asleep and facilitating going back to sleep in more detail). Medical treatment should be applied only if non-medical therapies are ineffective.

Increased need for sleep (hypersomnia)

It is increased sleepiness and need for sleep. Psychosis-like symptoms are mentioned among its symptoms, therefore it is often misdiagnosed or mistaken for schizophrenia. There is no known cure as yet, only symptomatic treatment is used which is done by medicating with amphetamine derivatives.

There is often an increased need for sleep of patients suffering from depression or hypothyroidism.

Daytime sleepiness (narcolepsy)

Patients may fall asleep during the day in the most varied situations and times without any preceding signs, and it can happen several times a day. They may fall into the REM phase from being awake (skipping the non-REM sleep stage). The duration of sleep is varied, it may last for a few minutes but may as well approach an hour's interval. Monotonous work or activities may contribute to its occurrence (reading, watching television). Sleep at night is generally interrupted, so during the day sleepiness and weakness are typical. Falling asleep suddenly increases the occurrence of accidents.

Presumably a neurotransmitter called hypocretin may be responsible for narcoleptic states. It is typical of the younger generation, and genetic factors contribute to its occurrence as well. It often goes together with hallucinations, sleep paralysis, and sudden loss of muscle tone (cataplexy). Cataplexy means suddenly weakened muscles presumably triggered by emotional effects, and as a result of this, the patient collapses. Paralysis during sleep can be stopped if the person who is sleeping is gently touched.

Nowadays narcolepsy cannot be cured, it can only be treated. In its treatment an important role is played by behaviour therapy (naps during the day for about twenty minutes, avoiding drinks containing alcohol, sedatives, multi-shift

working schedule, staying up for the night, and exhausting activities), and combined medical therapy.

Part of physical therapy is if the indicidual avoids activities that are dangerous for him (driving, swimming), and boring, monotonous activities (watching television). Further factors triggering narcoleptic attacks such as high temperatures, heavy and too much food, staying in a closed space for a long time and low level of stimuli should be avoided.

Having drinks containing caffeine may help prevent attacks from developing, but they should not be drunk right before night sleep, because they hinder the development of deep sleep.

Lasting sleep deprivation

It is a disorder which involves a reduced quantity and quality of sleep. It is not a real illness, because generally the sleep cycle is disrupted due to the lifestyle of the individual. It often happens when the individual looks after elderly people, a newborn baby, because they must adapt their own daily rhythm to others. In the case of sufficient quantity of sleep that is interrupted (feeding a baby every 3-4 hours), sleep loss can still develop, because the sleep cycle is not finished.

Sleep apnoe syndrome

It means pauses in breathing during sleep, which awakens the patient from sleeping, but they do not always realize it. A broader description of sleep apnoea can be found in the chapter called Vital parameters.

Parasomnias

Sleepwalking (somnambulismus)

It is a disturbance in the quality of sleep, which occurs in the first half of the night, and is mostly typical of the 4th phase of non-REM, but it can occur in the REM phase as well. It is more often typical of children than of the adult age group. It is a dangerous sleep disorder because the patient is not aware of what they are doing, therefore they cannot control their activities either. Generally they get out of bed and walk, but they may often leave the house, in this way endangering their own bodily safety. Only very rarely can they remember these. They can also carry out an orderly set of activities, so they can only be recognized in the street by their clothes or face that shows no mimicry. It is difficult to involve them in communication. During sleepwalking the patient often goes back to bed and falls asleep by themselves, spontaneously, but they can partly be directed, so accidents can be prevented. As a way of prevention, windows and doors must be locked for the night. Sleepwalking is facilitated by exercise done before going to bed, therefore those individuals who tend to sleepwalk should not do exercise two hours before going to bed.

Talking in your sleep (somniloquism)

It is more frequent with the younger generation, can go together with sleepwalking, but the two do not necessarily go together. It is generally sensible, coherent words or sentences, which the individual does not remember after waking up. It can associate with external noises or dreams, and emotions can be connected to it.

Night fear, horror (night terror)

They are most often typical of the 4th stage of non-REM, mainly occur with children. The individual cries, screams in their sleep, or shows other somatic signs of fear (pulse, blood pressure, breathing is faster, shivering and sweating can be observed). They cannot remember this night terror. Help can be given if the individual is comforted without awakening them, or help them to go back to sleep again after an attack if they awake. They can sometimes get out of bed, at such times their safety should be maintained, and relax the individual by talking calmly and softly.

Nightmares

Generally they develop at the REM stage from frightening experiences seen or heard during the day. Nightmares may develop as a result of side effects of medicines, sleep deprivation and stress as well. At this stage the muscles which move your body are not active. Mostly they are remembered and they can also awaken the individual from sleep. In order to prevent it do not let children watch television in the evening before going to bed or play violent games.

Night calf cramp

It is a painful cramp in the muscles during the night, which primarily occurs in the thick muscle of the calf and the small muscles of the foot. Cramp in the calf may occur as a result of several causes, for example pointing foot, strained muscles, renal insufficiency, metabolic disturbances, low levels of calcium, potassium, sodium and magnesium.

It has to be treated primarily by the application of physical techniques which involve stretching before going to bed, placing a magnet under the area concerned, or avoiding pointing feet. Stretching the toes (pointing) can be prevented by making the bed shorter with a pillow, or wearing shoes while sleeping, using a bed tunnel in order to lessen the weight of the blanket, or by raising the leg of the bed. Massaging of the area and stretching after the cramp help to ease the pain. If strained muscles occur due to anatomical causes, turn to an orthopaedist, who may prescribe suitable insoles for them. Medication may be necessary if physical techniques are of no help (J. Paul Caldwell, 2001).

Nocturnal sleep-related eating disorder (NSRED)

During the night the individual wakes up and immediately after he eats quickly and a great amount. Typical symptoms can be observed: the individual gains a lot of weight in a short time while they eat little during the day, and is not hungry in the morning either. The individual is tired during the day. They consume food that is rich in calories and fat at night, which they do not do during the day. Accidents are frequent: consumption of poisonous, harmful food and chemicals, injuries caused by cutlery.

Teeth grinding (bruxism)

Grinding your teeth during sleep may be a response of the body to venting stress, irritation, anger, pain. Further causes may be too high fillings, not suitable dentures, misalignment of jaws and teeth. Teeth grinding is more typical of people belonging to certain personality groups (aggressive, precise). Teeth grinding can be worsened by alcoholic drinks and antidepressants. It can affect the individual's health through damaged teeth, headaches, problems with joints. Room-mates may be disturbed by the sound. Due to these factors, it is important to treat teeth grinding. In the course of its therapy behaviour therapy, stress management methods and a bite raise that can be placed in the mouth can be used. The individual should see their dentist if teeth grinding occurs due to an anatomical reason.

Sleep paralysis

The patient feels as if they were paralysed. That are not able to move their body or speak. It is a frightening state, which most often occurs when getting up or falling asleep.

Bedwetting at night (enuresis nocturna)

During the night children may lose the control to retain and empty urine, and they wet the bed. They are rarely awakened by the phenomenon, which is typical of all stages of sleep. The clinical picture is only considered to be pathological after the age of four. The causative factor is important for therapy, which is psychotherapy in case of a trauma, furthermore it can be imipramine - therapy and conditioning. A special appliance is needed for conditioning, which gives a sign when urine drops appear (more details can be read about the appliance signalling urine emptying in the chapter called The need to urinate, modified urination).

Snoring

Snoring is the sound of breathing out, which is obstructed during sleep causing the vibration of the soft parts of the upper respiratory tracts. It mainly occurs during deep sleep and lying flat on one's back, because the soft tissues relax and obstruct the airway (tongue, uvula, tonsils, pharynx). Snoring can occur not only due to narrowed upper respiratory tracts and lowered tone of muscles, but also due to being overweight, tissue enlargement and increased deep sleep. Alcohol consumption triggers tissue swelling, while antihistamines and sleeping pills cause muscle relaxation.

Part of therapy is eliminating the trigger, therefore it is advisable to get rid of excess weight, to cut out alcoholic drinks, sleeping pills, antihistamines and smoking. Individuals can achieve decreased deep sleep if they regularly get enough sleep, so they are not tired. Raising the upper part of the bed helps to open respiratory tracts and obstructed upper respiratory tracts can be prevented by adequate humidity.

Sleeping on the side: in this sleeping position the stricture of the upper respiratory tracts diminishes. There are several techniques to get individuals used to sleeping on their sides. Objects fixed to the back will facilitate choosing to lie on the side due to the discomfort when lying on the back. Pillows can be used to prop up the back, and a way of getting used to sleeping on the side is gradually raising one side of the pillow under the head.

A specialist opinion should be sought if there is an anatomical deviance or allergy in the background (Caldwell, 2001).

There are several appliances to block snoring, there are clips that can be placed in the nose, a device which restricts the movement of the lower jaw, a stimulant fixed to the wrist, or teeth braces that fix the position of the tongue.

If none of the therapies work, surgery can be considered.

Medication

Hypnotics and anxiolitics

They help to fall asleep and sleep through the night, so they should be administered before going to bed. Before administering the medicine the nurse has to check whether the patient is prepared to sleep!

Sedatives have a calming effect, that is why they are used for certain mental illnesses as well. The hypnotic or sedating effect can be achieved depending on the quantity of the administered medicine. A small quantity of sedatives has a calming, relaxing effect, a bigger quantity of them has a narcotic effect. The ideal medicine has a quick effect, and it does not cause discomfort after awakening, e.g. headache, dizziness, visual disturbance (similar to symptoms of a hangover).

- Anxiolitics: they relieve anxiety, the most often used are benzodiazepines.
- Sedative effect: relieving nervous tension, fear, worry; barbiturates can be highlighted.
- Hypnotics: help to fall asleep and sleep through the night.

Sleeping pills and sedatives only improve the quality of sleep for a short time, because they disrupt the sleep cycle. They block the deepening of sleep, and through this they generate symptoms similar to 'hangover'. The patient's sleep disturbance intensifies, and the typical symptoms return, such as daytime tiredness, somnolence, decreased ability to perform, memory disturbance, being confused. Seeing the side effects of medications always bear in mind that it is worth preferring non-medication therapies.

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20. Medication – The Types and Rules of Parenteral and Non-parenteral Medication

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Introduction

For the sake of safe medication nurses are required to know the mechanism, indication and dosage of medicines, the process of identifying exact dosages, possible side effects and interactions. Neglecting to administer medicines or administering inappropriate doses or applying inappropriate methods can cause serious harm to the patient; or may even have lethal consequences.

Concerning medication, basically it can be stated that the task of the nurse is limited to prepare medicament and administer it in accordance with doctors' prescriptions both in internal an international practice; internationally however, there are several types of post-graduate training courses following the completion of which nurses are competent to prescribe medicine autonomously. Under appropriate regulations, nurses in the United States with an Advanced Practice Registered Nurse (APRN) degree can prescribe several products, whereas in England and certain Scandinavian countries even antibiotics may be prescribed under certain protocols.

While a wide range of knowledge is presented in this chapter, however, it is not sufficient for the acquisition of the previously mentioned competence, but it provides nurses engaged in everyday practice with a sufficient basis for a complex insight of medication tasks and to insure their safety.

Pharmacology

The subject and most important notions of pharmacology

Pharmacology
the study of substances affecting living organisms and their functions - i.e. pharmacons. Medical pharmacology involves substances for the prevention, identification and treatment of diseases, i.e. medicines or pharmaceuticals.

Pharmacon
substance capable of affecting the functions of living organisms in appropriate dosage. The Greek word 'pharmacon' – like the English term 'drug' can equally mean medicine, poison or illegal drug.

Medicine
a substance or a mixture of different substances which can be applied for the prevention, diagnostics and treatment of diseases; or for maintaining, recovering, improving or modifying physiological functions.

Magistral medicine/formula
a pharmaceutical product prepared by a chemist in a chemist's shop according to the regulations of the pharmacopoeia or the Formulae Normales (Fo-No; or 'Standard Prescriptions'). The preparation of magistral medicines can take place on doctors' demand or initiated by the chemist as well.

Homeopathic medicine
medicine containing ingredient(s) that are produced from substances known as homeopathic stock solutions, and are produced according to the homeopathic production processes.

Narcotics
are pharmaceuticals containing active ingredients qualified as narcotics under the respective legal regulations.

Psychotropics
medicine containing active ingredients qualified as psychotropics under the respective legal regulations.

Drugs
phytogenic or animal organs, tissues or other natural substances used as medicine are called drugs.

Poison
substances that, interacting with living organisms, cause damage, disease or death if an adequate quantity enters the organism.

The main areas of pharmacology

Pharmacodinamy studies the effects and mechanisms of medicines.

Pharmacokinetics studies the fate of pharmaceuticals within the body.

Experimental pharmacology
provides pharmatokinetic and pharmacodynamic information with the help of laboratory animal experiments.

Clinical pharmacology
involves clinical medical research bordering pharmaceutical development. Studies include administering medicines, their absorption, distribution, elimination, biological efficiency and other factors (such as interaction and toxicity).

Toxicology
studies harmful and undesired effects of exogenous substances on the living organism.

Pharmacy
is a discipline involving the production, study and dispensation of preparations used as medicaments.

Forms of medicine

Solid medicines (Pethő 2003, Fürst 1998, Vízi 1997)

Teas (species,-ei)

Herbal teas are the mixture of whole or chopped up phytogenic drugs that can be dosed by the patient according to instructions, by making a tea from a heaped teaspoon/tablespoon of the drug and 2–4 dl water by soaking, infusion or boiling; but some mixtures also are available in filter form. The tea can be consumed instantly or in smaller doses after straining. Its disadvantage is that dosing may be inappropriate.

Powders, body powders (pulvis,-is, sparsorium,-i)

Powders are solid medical preparations that may be undivided or divided into doses, which can be intended for internal or external use. Body powders are for the treatment of the skin's surface, they may have anti-fungal, drying or cooling effects among others. Undivided powder is dosed by the patient, while other powders are available as divided into capsules or doses. If the active ingredient has a strong effect, the powder must be divided for accurate dosage.

Pills, tablets, lozenges (tabletta,-ae, compressum,-i)

Pills are compressed preparations with diverse looks, containing a prescribed amount of active ingredients. This is the most frequently applied form of medication in everyday practice, as it makes up 30-50 % of registered medicines. The size and weight of pills is affected by the amount of active ingredients and the way of their application. They usually weigh no less than 0.1 g, their shape may vary from round, oval or elliptic to triangular or square. Pills are made up of active ingredients and intermediates; the latter are aimed at increasing weight, improving flavour, coherence of the ingredients, colouring, protection against external impacts, or even ensuring the disintegration of the pill in case of effervescent tablets. The location or speed of absorption also can be affected by various intermediates or technologies (e.g. retard pills – with delayed discharge of active ingredients). Concerning their administration, pills can be peroral, sublingual, buccal, chewing pill, soluble, vaginal or implant-like preparations.

Capsules (capsula,-ae)

Capsules are orally administered, dosed preparations containing solid or liquid active ingredients. The case enclosing the medicine is usually made of gelatine or starch. It is an important task within patient education to inform the patient about the fact that capsules must not be opened, halved, and the powder or fluid within the capsule must not be taken without the shell (except for certain specific cases). Usually those ingredients are enclosed in capsules which are not suitable for producing pills or have an unpleasant taste or smell.

Semi-solid medications

Ointment (unguentum,-i)

Ointments are plastic gels aimed at the treatment of the skin and the mycoderm that mainly can be applied for local effect. Their consistence is determined by the proportions and characteristics of their ingredients. Their penetration into the deeper layers of the skin can be achieved with appropriate intermediates. Absorption can be enhanced by the emollition of the upper layer of the skin, e.g. by poultice, or by washing the affected area with soap and water before application. Both water- and lipid-soluble substances can be adsorbed from the surface of the skin easily, and can have a systemic effect. Ointments consist of active ingredients, a formulation base, and possibly of other intermediates. Their ingredients may have various chemical compounds (phytogenic or of animal fats, hydrocarbons, macromolecular gels, waxes, surface-active agents).

Ophthalmic ointment (oculentum,-i)

Ophthalmic ointments are sterile, soft ointments for the treatment of the eyes, which are produced from sterile formulation bases (Oculentum simplex, Oculentum basis or Oculentum hydrosum), in aseptic conditions. The advantage of their administration is that they have a longer lasting effect than eye-drops.

Cream (cremor,-is)

Soft ointments with a high water content.

Paste (pasta,-ae)

Pastes are semi-solid preparations with a high powder content (min. 40%), which are harder than ointments. They are usually used for covering the skin since it is highly adhesive.

Rectal and vaginal medicines

These preparations are solid at room temperature, produced with the appropriate intermediates that melt at body temperature or dissolve in body-fluids.

- ***Rectal suppositories (suppositorium,-i)*** weigh 1–3 g depending on the age of the patient, and they are 1–3 cm long. They are administered for local (for inflammatory diseases of the rectum or to stimulate defecation) or systemic effect (if per os administration is hampered or contraindicated, or in order to avoid the portal system).
- ***Vaginal capsules or ovules (ovulum), pessaries (globulus,-i vaginalis) and globulus-i vaginalis longiformis*** are applied for the local treatment of the vagina (bacterial or other infections, inflammations) and for contraception.

Pellets (pilula,-ae)

Pellets are ball-shaped, 0.1–0.3-g medicated globules usually aimed at the ingestion of solid active ingredients. This obsolete form of medicine is produced manually, nowadays mainly pills or capsules are used instead of pellets. Its disadvantage is that it is difficult to ensure microbiological purity.

Liquid medicines

Solutions (solutio,-nis)

Pure, precipitation-free, liquid pharmaceutical preparations produced by the dissolving active ingredients, for internal or external use.

Liquid medicines for external use

Solutions for gargling (gargarisma,-tis), wet wrapping, washing or painting (swabbing)

Solutions for gargling are to be mixed before use with the prescribed additional liquid (e.g. tap water, distilled water). It is important to always inform the patient about the dilution substance and rate.

Eye drops (oculogutta,-ae)

Sterile or microbiologically pure water-based or oil-based solution, emulsion or suspension for the medical treatment of the eyes. Eye drops may contain one or more active ingredients.

Nose drops (nasogutta,-ae)

Solution, emulsion or suspension containing one or more active ingredients for the treatment of the nasal cavity and the mycoderm of the nose. These preparations are mostly applied for the treatment of the (pathogenic or allergic) inflammation of the nasal mycoderm.

Ear drops (otogutta,-ae)

Solutions for the treatment of the external ear. In case of ear injuries sterile preparations are to be applied.

Ingested liquid medicine forms

Syrup (sirupus,-i)

Undiluted solution of sugar in water, or suspension or emulsion. It can be used for flavouring medicines but it also may contain active ingredients. Dosage: by spoon.

Drops for internal use (gutta, -ae)

Small-volume solutions to be dosed in drops, which are to be administered diluted with some other liquid. The weight of the drops is influenced by the surface tension of the medium. In case of a higher surface tension less drops with a bigger diameter drop out of the bottle.

Other liquid forms of medicine

Clysma/enema (klysma,-tis)

Medicine is administered through the rectum for a rapid effect. There are different types of enema such as medicinal, nutritional and cleansing. The preparation contains active ingredients, solvent, and mucilage in 30-40% for optimal effect.

Mixture (mixtura,-ae)

A solution containing herbal extracts (usually tincture), which also may contain suspended active ingredients in a fine dispersion; e.g. Mixtura pectoralis.

Elixir (elixirium,-i)

A medicinal solution containing a higher amount of syrup and tincture, e.g. Bronchicum Elixir.

Mucilage (mucilago,-inis)

High-viscosity, homogenous systems produced with the application of macromolecular agents (e.g. cellulose derivatives) e.g. Mucilago methylcellulosi.

Suspension (suspensio,-nis)

These preparations contain solid particles dispersed in a liquid medium, such as Suspensio zinci aquosa. These medicines have to be shaken before use.

Emulsion (emulsio,-nis)

This category includes ingested or external preparations made of immiscible liquid phases (e.g. external, dermatological preparation: Dalacin T 1% emulsion (antibiotic), or ingested laxative containing castor-oil: Emulsio olei ricini). These medicines have to be shaken before use.

Signature of liquid medicine forms

The bottles of magistral medicines for external use are marked with red signatures, while the ones to be ingested are marked with blue signatures. The inscription must include the name of the preparation and its manufacturer, the method of administration, the date of production and the expiry date.

Solutions for parenteral use

The absorption of intradermally or subcutaneously administered medicines is basically determined by blood flow, while the rate of adsorption when administering intramuscular injection mostly depends on the vascular bed of the muscles. In case of intravenous medication we cannot speak of absorption, since the medicament enters the blood circulation directly, therefore intravenous medication is to be chosen if rapid effect is desirable; if the medicine would absorb insufficiently from the gastro-intestinal tract, if it possesses a tissue-irritating capacity, or it is quickly metabolised per os. The absorption of parenterally administered drugs is determined by blood flow rate, the concentration, lipid-solubility, pH and viscosity of the solution, as well as the amount of medicine administered. The most significant risk of intravenous administration is the risk of overdosing, in which case the immediate removal of the applied drug from the body is not possible. As a general precaution, intravenous medicaments have to be injected slowly and must be suspended immediately if the patient feels sick. Nurses must be aware of the fact that non-dissolved particles in the medicine may cause embolism, thus extraordinary care must be taken when preparing and drawing solutions. Since parenteral dosing is an invasive process, the risk of infections should be considered, therefore administration always has to be carried out with the observance of asepsis-antisepsis.

Parenterally administered liquids include solutions, suspensions and emulsions. To prepare the solution the substance – dosed by weight – has to be solved or diluted to a prescribed volume. Injection preparations are sterile solutions, suspensions or emulsions filled in ampoules or other suitable containers (plastic or glass vials) with a maximum volume of 50 ml. Those injection preparations are prepared as powder ampoules the active ingredients of which cannot be stored as solutions without being decomposed even with stabilisers. In this case the active ingredient is filled in ampoules or rubber-capped vials in the form of powder or microcrystals, and the sterile solvent medium is attached separately, thus the solution or suspension can be prepared directly before use. Usually distilled water for injections or sterile physiological saline is used for making the solution. In case of injections they are required to be pyrogen-free (pyrogen: a substance, disengaging from the cell walls of bacteria and inducing fever, which is not eliminated during heat sterilisation.) Injection preparations usually contain preservatives as well; the preparations are made and sterilised in an aseptic way.

Ideally, the osmotic pressure and pH of the injected preparation is equal to those of the blood serum (isotonic and isohydric). These conditions cannot be ensured in each case, thus injection preparations are accepted between pH 5 and 7. Solutions of different pH values cause pain when injected under the skin, whereas these and other solutions causing pricks and irritation can be injected into muscles.

Hypotonic solutions cannot be injected intravenously because in hypotonic solutions water can enter the red blood cells via osmosis, which may cause hemolysis. Hypertonic solutions may be administered intravenously if they are injected slowly, since they dilute during the act of injection. There are some injected preparations that can be administered intravenously only, otherwise they may cause necrosis.

The routes of administration of injected preparations include the following: subcutaneous, intracutaneous, intramuscular, intravenous, intra-arterial, intracardial, intrathecal, and intra-articular injections. Depot injections provide a long-lasting prolonged effect; the rate of absorption is prolonged. If the active ingredient is administered subcutaneously or intramuscularly in an oil-based solution or in the form of poorly soluble suspension, absorption will be slow and even, while watery solutions absorb faster.

Manufactured injection ampoules the concentration in percents and the volume of the active ingredient is indicated (1 ml solution contains as many cg of the active ingredient as indicated in per cent). Actually, ampoules contain 5-10% more fluid than the indicated volume so that the loss resulting from drawing the liquid up from the ampoule or from the removal of air.

Infusion is 50–1000 ml of parenterally administered, sterile and pyrogen-free liquid. It may be indicated e.g. for volume and ion supplementation, medication or artificial nutrition. The infusion solution can be stored in plastic bags and glass or plastic bottles.

Pharmaceutical preparations made by extraction

Infusion (infusum,-i), decoction (decoctum,-i)

These preparations are made from phytogenic drugs by maceration at a prescribed temperature. Infusion is made from loose-structured parts of plants (flowers, leaves) by soaking them for 20 minutes, decoction is made from thicker parts (bark, roots) with hot water, for 40 minutes.

Extract (extractum,-i)

Extracts are produced from phytogenic drugs by way of extraction with appropriate solvents, and usually by concentration (the extract can be liquid, semi-thick, thick or solid).

Tincture (tinctura, -ae)

Thin extracts usually extracted from phytogenic drugs with alcohol or ether.

Other pharmaceutical forms

Aerosol (Aerosolum,-i)

Aerosols are pharmaceutical preparations for inhalation, consisting of particles of 0,001-100 micrometres in diameter. Depending on their size, the particles are deposited in different parts of the respiratory tracts. Aerosol particles may be wet or dry. Nebulisers and metered-dose inhalers usually produce wet, while powder inhalers produce dry aerosols. Particles of 0.5-5 micrometres are the most efficient since they reach even the smaller airways. Particles smaller than 0.5 micrometres are not deposed, so most of them are removed by exhalation. Particles between 5 and 8 micrometres mostly are deposited in bigger airways (bronchi), while those that are bigger than 8 micrometres are deposited in the pharynx. (Pomázi, 2009; Kevin, 2000)

Transdermal Therapeutic System (TTS)

Transdermal patches are flexible pharmaceutical preparations containing one or more active ingredients applied on intact skin surface, which are available in various shapes and sizes. They provide systemic effect, that is, the active ingredients enter blood circulation through the skin. One aim of transdermal medication is to evade the first-pass effect (metabolism) of the liver. Substances entering the liver from the stomach and the small intestine via portal circulation can lose their activity because of the metabolism before they could enter systemic circulation. A further advantage of transdermal medication is that the release of the active ingredients is controlled, therefore it is continuously passed into the circulation (the risk of overdose is only minor), so this route of administration is suitable for dosing drugs with a short half-life. Besides, the patch is easy to apply and the effect of the medicine can be rapidly eliminated by its removal, and co-operation of the patient is usually favourable in case of transdermal medication. Its disadvantages are that irritation of the skin may occur; it is not suitable for the immission of bigger molecules (only molecules smaller than 500 Daltons can enter through the skin), and in some cases (e.g. certain skin types, sweaty skin) adhesion is not adequate (Soós, Erős, 2002).

Nursing tasks in medication

Before the administration of the prescribed pharmaceuticals it is extremely important to check on the patient's name, the name of the medicament, the route and time of administration and the expiry date of the medicine. Observe the indication, effect mechanism and side effects of the medicine, as well as the nursing tasks depending on the route of administration.

Information should be obtained regarding the patient's habits of medicine taking, previously applied medications, current prescription and non-prescription medicines – how often and for what indication, and if any allergic reaction, side effect or complication related to the previously mentioned medicines has occurred. Ask the patient to describe the reasons, symptoms and treatment of any allergic reactions. Besides medicine allergy, food allergy also must be enquired about (several medicines may have ingredients which are present in some food as well).

Enquire about the patient's social and financial status, e.g. age, qualifications, job. (In certain countries taking an anamnesis also includes asking about health insurance).

Assess the patient's consciousness, awareness to assess to what extent the patient is able and willing to co-operate in the process. The level of knowledge is necessary to be assessed in order to define the level of patient education. To estimate the patient's anxiety, observe both verbal and non-verbal signs. Determine to what extent the patient understands instructions and how well (s)he is able to follow them. For interventions it is essential that the patient follows instructions accurately and take the appropriate position if necessary. Also assess the patient's abilities to take medication independently. The assessment also must include if the doctor's instructions concerning the patient's age, weight, and the method of medication are legible.

During preparing medicines and medication it must be ensured that there is enough time for carrying out medication safely and for the education of the patient. Nurses are required to be aware of the possible side effects of the medicines, and to recognise these as soon as possible. The patient's ability for long-term co-operation also should be considered.

Co-operation of the patient: compliance and persistence

The notion of compliance

Medication compliance

gives information about the accuracy of medicine taking. It shows us to what extent the patient keeps to the timing, dosing and frequency of the prescribed medication. Compliance is a value referring to a certain interval, given in percents. (Cramer 2008).

Compliance can be measured with several direct and indirect methods such as the evaluation of plasma drug concentration, electronic monitoring / pill-boxes with processor chips, monitoring of pharmaceutical effects, monitoring of side effects, questionnaires, interviews. It must be noted that the exact value cannot be measured, however, it can be estimated.

Among direct methods of compliance measurement, pill-boxes with microprocessors are used most frequently, which reveals the supposed time of ingesting the medicine (although it is not guaranteed that the patient takes the medicine after opening the box). Compliance value is often defined by posterior analysis of the respective data bases (within a retrospective framework).

According to literature patients take 70–80% of the prescribed medicines following the instructions with the application of the electronic devices that help the most accurate evaluation of compliance. It is noticeable that, on the one hand, patients often reduce the dosage of prescribed medicines on their own, on the other hand, they take more or less than the recommended dose due to forgetfulness during monitoring (Cramer 2003). Non-compliance factors include the frequency of medicine taking, the patient's way of life, if the patient needs to take other medicines as well and if any side effects have occurred. The disease itself and its severity, along with some demographic characteristics of patients have been proved to be non-determining factors (Nagy, 2007, Cramer et al. 1989).

The notion of persistence

The duration of medication is shown by the persistence of pharmacotherapy, the duration index of the quality of medicine taking. In practice it usually refers to days, but it can be given in months or even years as well (Cramer 2008).

Persistence can be defined in several ways (Peterson 2007):

The sum of the days of taking medicine from initiation (or from an arbitrary time in case of chronic diseases) to discontinuation of the therapy, but the relation of the number of prescriptions made out and the number of refills. Another index is the rate of patients receiving therapy at a given time.

On examination, the permissible gap is defined. It means the maximum of the interval between refills, which is not regarded as the discontinuation of the therapy (Ágh 2009). Relevant data can be collected from various institutional or GP's databases.

Interventions improving the efficiency of patient co-operation

Healthcare staff play an important role in developing adequate patient co-operation. Sufficient time and patience must be given to inform patients in case of each newly admitted or recently diagnosed patient. The patient must be involved in the therapy as a partner (Ágh 2001). The patient has to be informed and has to learn about the disease including its symptoms and complications. The questions must be answered in accordance with the professional competence in every case. The patient also must be assured of the support of the healthcare staff. During patient education the aim of medication and the probable rate of achieving the target values must be outlined. The motivation of patients can be increased if patient education is carried out within an organised framework, such as in patients'groups or clubs.

The patient must be aware of and prepare for possible side effects. Patients have to be provided with information on medication in written form too, e.g. with informative booklets. It improves compliance if the patient has an insight in the process of the examination and the therapy. Observance of the above aspects is an essential condition of developing good patient co-operation, however, only partial therapy-adherence may be achieved solely with patient education. (Verweyen et al. 2007). In the treatment of chronic diseases long-term contact and care play an essential role, including the development of a medication strategy that contributes to the continuation of the relationship between doctors and patients. When selecting medicines, the patient's characteristics and the expected adherence to the therapy should be taken into account. When adjusting pharmaceutical therapy every effort should be taken to ensure that medication is as simple as possible. Pharmaceuticals with a prolonged effect, which are enough to be taken daily, are preferred. Multiple medicines taking daily have a significant deteriorating effect on adherence (Guillausseau 2005, Shi et al. 2007). According to research it is advisable to choose fixed combinations (these forms of medication increase compliance and persistence by 15–25%). Among secondary diseases, depression significantly reduces adherence to therapy.

Patient education

The aim of patient education is to gain the patient's co-operation in prevention and therapy so it can be as efficient as possible. Patients have to be informed about their diseases, the possible effects on the quality of their lives, the causes, the options for prevention and treatment, the consequences and side effects of the treatment, and the possible consequences of the discontinuation of the therapy.

The most important aspects of patient education:

- Inform the patient – keeping the patient's age, condition and mental state in mind – about the name of the applied medicine; the active ingredient and generic name of the product; the aim of medication; the appearance of the medicine (size, colour, shape); dosage; the route of administration; maximal duration of medication; how the efficacy of the pharmaceutical can be recognised; what to do if the patient forgets to take the prescribed medicine; which other drugs may interact with it; possible side effects; storage of the medicine.
- Inform the patient how much time administering the medicine takes.
  - In case of otologic treatment: 5–10 seconds
  - Vaginal administration: max. 15–30 seconds
  - Nasal medication: 5–10 seconds
  - Metered-dose inhalers and powder inhalers: 5-8 seconds; nebulisers: 15–20 minutes
  - Injection: 5–10 seconds
  - Rectal administration: max. 15–30 seconds
  - Eye drops: 5–10 seconds
  - Transdermal patches: 5 seconds
- Acquaint the patient with the bodily position necessary during intervention, and with any movement restrictions.
- Make sure that the patient is able to shift into the necessary position and to stay motionless during medication.
- Inform the patient of any discomfort that may occur during the administration of the medicine.
- Inform the patient to report any symptoms occurring during or after the intervention to healthcare staff.
- Teach the patient the independent medication techniques.
- Provide the patient with a written version of the education material as well.

Patient education about the storage of medicines at home

Home medicines are advised to be stored in a dry and cool place in a cabinet exclusively for this purpose, which can be locked and is out of the reach of children. Always pay attention to the expiry date of medicaments; if they are not taken regularly, it is advisable to check them before use. They can be handed in in any chemist's shops after they are expired. To prevent contamination only remove original packaging directly before use. Follow doctor's instructions exactly: if the doctor instructions differ from the package of the medicine, observe doctor's prescriptions in dosage. Doctors usually inform patients about possible side effects and phenomena accompanying medication, but it is worth informing the patient to read the attached information leaflet as well. If patients experience any symptoms differing to the ones informed by the physician, or unusual, too intense effects, they should consult their physician immediately. Some medicine may be left after recovery as well which are not instructed to be taken by the doctor. Any medicine left must be kept out of the reach of children or be destroyed or taken to a chemist shop; they should only be used if the doctor prescribes the same pharmaceutical again.

Several drugs can induce addiction the treatment of which is an even more difficult process and mostly requires hospitalisation. These drugs include not only narcotics and tranquillisers but e.g. appetite reducers and laxatives, which are easy to depend on but difficult to cut down on them. Attention should be paid to the doctor's or producer's instructions concerning driving and dangerous jobs. Certain pharmaceuticals (and not only narcotics and tranquillisers) slow the reflexes, cause sleepiness, slow motions and thinking. It is essential to ingest medicine only at the time when it is instructed: e.g. before, with or after meals. It is dangerous to take alcoholic beverages or food during medication.

Several patients have to take more than one medicine at home. Nurses can help in arranging a schedule for taking medicines with respect to the minimal intervals between ingestion of medicaments. A summary chart for the patient can be prepared which shows the medicines and the appropriate times for taking, and the daily doses for each part of the day can be packed into dosage boxes for a week in advance.

The essentials of the home medicine kit are suggested to include the following:

- Regularly taken prescribed medicines,
- Analgesics, antipyretics, anti-inflammatory drugs (acetylsalicylic acid, ibuprofen, paracetamol, diclofenac) in various forms (syrup, suppository, pill),
- analgesics for toothache (e.g. Demalgon),
- disinfecting pharmaceuticals with local analgesic effect for sore throat,
- cough mixtures and expectorants,
- nose drop, nose spray,
- common cold medicine,
- herpes cream,
- vitamin C and other vitamin products,
- anti-constipation and anti-diarrhoeal preparations, charcoal pills, rehydration powder, probiotics,
- digestive pills, antacids, medicines for heartburn,
- antispasmodics for women (e.g. Meristin), antispasmodics (e.g. No-Spa or Papaverin),
- burn relief preparations (e.g. Irix, Panthenol),
- zinc suspension (for stings and bites),
- product for alleviating itching caused by insect stings and bites (e.g. Fenistil),
- calcium pills for relieving allergic symptoms,
- Neomagnol tablet is suitable for disinfecting wash (warning: external use only),
- Wound care kit (lint, flexible bands, sticking plasters, adhesive tapes, some sterile gauze pads, sterile cotton, disinfection fluid, iodine tincture, talcum powder for wounds, possibly tablets for making disinfectory solution, wound healing cream, sterile rubber gloves, scissors, triangular bandage),
- 2 thermometers,
- splinter tweezers, tic tweezers,
- nose vacuum and rectal pipe also are advisable if there are young children in the family.

Nursing tasks in medication

Guidelines in medication (Malcolm 2010)

In medication administration nine "rights" have to be observed in every case. The right patient has to receive the right medicine in the right dose at the right time, in the right way and in the right form. The basic rule includes the right action, the achievement of the right effect and the documentation following medication.

The nine rights of medication administration

- Right patient
- Right drug
- Right route
- Right time
- Right dose
- Right form
- Right response
- Right action
- Right documentation

1. Right patient

It is a basic requirement to verify the identity of the patient before medication administration. This can be done by checking the wristband, especially in case of non-cooperating or unconscious patients, or the nurse can ask the patient's name.

2. Right drug

Research has proved that one third of medication problems arise from administering the wrong drug (Selbst et al. 1999, LaPointe 2003). To avoid mistakes, the name and efficacy of the drug always have to be checked. Before medication compare the bedhead board or medication chart of the patient with the prescription first.

During medication, the inscription on the container of the medicine needs to be checked three times:

- Before the drug is taken out of the medicine chest
- When the necessary dose is taken out of the container
- Before the container is placed back into the medicine chest

Healthcare workers can only administer medicines prepared for administration by themselves.

3. Right time

Medications must be administered at the prescribed time to ensure therapeutic levels. The intervals of administration can be defined:

- According to daily frequency (1x, 2x, 3x, 4x, 5x). These medications usually need to be administered in waketime.
- In hours: every 2, 4, 6, 8 or 12 hours.

4. Right route

Medicaments can be administered into the body and to the locus of the effect by several routes. The most common routes are: per os (through the mouth or a probe), parenteral (intradermal, subcutaneous, intramuscular, intravenous), through mycoderms (sublingual, inhalation, nasal, transdermal, vaginal, rectal). Always check the route of administration indicated on the container of the drug and by the prescriber. If any doubt arises, consult the prescriber.

5. Right dose

Always read the medication chart or the bedhead board carefully. Certain medicines are available with varying content of the active ingredient, e.g. Betaloc 10 mg, 50 mg, 100 mg. Check the decimal points as well, because either a tenth or ten times of the prescribed dose can result in serious reactions. It is important for the nurse to be aware of the usual dosing of drugs, because any possible erroneous entries in the documentation must be recognised.

6. Right form

Medicines are available in various forms, e.g. Paracetamol is sold as pill, capsule, syrup, suppository and ampoule, thus its various forms may be mistaken for one another.

7. Right action

In medication we also need to know the indication of the therapy. For example, *it is not appropriate to administer an antibiotic for a viral infection, nor an antiviral for a bacterial infection.* It is useful to tell the patient what kind of medicine (s) he will receive and why before administration, because this way the patient can inform the nurse if they have any concerns.

In case of children or confused patients even greater caution is required because they are unable to give appropriate feedback during medication.

8. Right response

Once a medication is administered, the nurse should monitor the patient to check if medication has the desired effect or response or whether any side-effects or allergic reactions have occurred. Monitoring can involve the assessment of blood glucose level, vital signs, or other parameters such as the quality and quantity of urine output (Wilson 2004).

9. Right documentation

The administration of any drug must be noted on the bedhead board / medication chart clearly, and the nurse that has administered them must sign the chart as well. The act of administration must not be recorded before it is carried out.

Abbreviations in medication

In the following, standard abbreviations in everyday nursing practice are presented, which nurses can encounter during medication

Household measurements

In connection with home medication apothecaries' measurement cannot be used, therefore so-called household measurements are defined as well. Concerning their application, the task of the nurse is to instruct patients on appropriate dosage and application. The advantage of this system is that ordinary measurements are used for dosing medicines, which can be found in patients' homes as well, such as drops, teaspoon, tablespoon, cup, or grams, pints and quarts for weight. Although the tools necessary for these measurements can be found in almost any household, inaccuracies may occur, which is a disadvantage of the application of household measurements. They can be eliminated by using calibrated oral syringes or droppers/pipettes which are available in chemist shops or attached to certain medicines.

When using droppers/pipettes, the volume of drops also must be taken into account, which is determined by several parameters such as the temperature and viscosity of the liquid, the diameter of the calibre of the tool (i.e. the internal diameter of the pipe or needle), that is, the size of the drop may vary with different diameters. The angle of the position of the dropper also may influence the size of the drops; ideally the tool is held at 90° during application. The pressure on the dropper also can change the number and size of drops.

Nurses must know household measurements and their abbreviations before using them.

Prescription types

Continuous prescription: the patient must take the drug continuously for a prolonged period, until discontinuation of the therapy is prescribed. In case of certain chronic diseases such as hypertonia the prescribed medicine must be taken permanently, all through the patient's life.

Pro re nata (P.R.N.) means according to need. The dosage of the drug and the intervals between administrations

Table 1. Abbreviations concerning the route of medication administration (Source: Saxton et al 2005)

English/Latin abbreviation	Route of administration English expressions
ID	intradermal
SC	subcutaneous
IM	intramuscular
IV	intravenous
IV PB	intravenous piggyback
SL	sublingual, under the tongue
GT	gastrostomy tube
NG	nasogastric tube
NJ	nasojejunal tube
p.o.	by mouth, orally
p.r.	per rectum, rectally
O.D.	right eye
O.S.	left eye
O.U.	both eyes
A.D.	right ear
A.S.	left ear

Table 2. Abbreviations concerning the forms of medication (Source: Pethő 2003)

Abbreviation	Latin expression	English expression
pulv.	pulvis,-veris m	powder
tabl.	tabletta,-ae f	pill, tablet
drg.	drage	pearl
pil.	pilula	pellet, tablet
caps.	capsula, -ae f	capsule (shell, casing)
supp.	suppositorium,-ii n	suppository
glob.	globulus,-i m	ball
Glob.vag.	globulus vaginalis	pessary
ung.	unguentum,-i n	ointment
Oculent	oculentum,-i	ophthalmic ointment
sol.	solutio,-onis f	solution
gtt.	gutta, -ae f	drop
aerosol.	aerosolum ,i	aerosol
inf	infusio,-nis	infusion
inj.	injectio,-nis	injection

are prescribed by the doctor. In such cases the nurse has to decide if the patient needs the medication (e.g. analgesics, antipyretics).

Occasional prescription: the prescribed drug needs to be administered only once, e.g. at the preparation for diagnostics or operations (Atropine inj.), or for alleviating pain.

Immediate (statim): the prescribed medicine needs to be administered only once but immediately. It is usually applied in emergency cases.

The dosage of drugs

After calculating the dose, the nurse measures the necessary amount with standard measurement tools. Spoon types used for measuring liquid medicine forms can be the following:

- Tablespoon=15 ml=kb.15 g
- Children's spoon=10 ml=kb.10 g
- Teaspoon=5 ml=kb.5 g

The size of household spoons may vary, thus causing inaccuracies in dosing and measuring medicines. To compensate for this, various measuring spoons and syringes are available in chemist shops. For per os medication, medicine cups, droppers**,** calibrated spoons and oral syringes also can be applied. Medicine cups are advised to be used only if the liquid to be dosed is more than 5 ml, since less liquid cannot be measured accurately with this tool. Droppers can be used only for measuring less than 5 ml; they can be applied in the mouth, nose and ears as well; and the changes in the size of drops resulting from the properties of the dropper and the solution must be taken into account when measuring the dose. Calibrated spoons can be used for administering drugs directly by mouth or in food. Oral syringes can be used if the solution to be administered is more than 5 ml. Needles must not be attached to oral syringes.

The prevention of medication errors

In practice some errors may occur in connection with medication, induced by several factors such as lack of nursing staff, exhaustion and inadequate equipment.

Medication errors can occur in several phases of the process, therefore it is important that nurses observe the nine rights of medication so as to improve patients' safety and prevent any potential mistakes. The most common errors in medication may be the following:

- inappropriate medication labelling
- *miscommunication among the members of the health-care staff*
- *lack of verification*
- *a disorganised and insufficiently equipped medication trolley*
- *an incomplete medication prescription*
- *inadequate staffing levels.*

Medicine storage in healthcare institutions

Under institutional circumstances medicine storage happens under laws in effect and the regulations of local and European Pharmacopoeia, pharmaceutical institutes, and local work safety and fire protection regulations.

In any hospital ward the amount of pharmaceuticals necessary for everyday care can be stored and used, recorded by the dispensary. Pharmaceutical preparations are to be stored in a locked cupboard in a separate room, medicines to be cooled can only be stored in refrigerators used solely for that purpose. The storage of infusion solutions, disinfectants, dressings, and flammable or explosive substances also requires a separate storage room. Drugs must be protected from dust, moisture and heat. The room for medicine storage is required to be dry, relative humidity can exceed 70% only temporarily, and the temperature must be between 15°C and 25°C. Storage rooms and pharmaceutical grade refrigerators must each be equipped with a thermometer. The ideal temperature of the refrigerator is between 3-7°C. Temperatures must be checked continuously and must be recorded and documented at least weekly. If the temperature of the room or the refrigerator does not fall in the desired range, the staff responsible for medicine storage, who will take necessary steps, must be notified immediately. A physician responsible for medicines needs to be appointed in every ward, together with a nurse (usually the head nurse).

The storage of controlled drugs is regulated by further rules besides the above mentioned ones. Such medicines must be stored in a lockable safe within a lockable cupboard in a separate room (usually where the other medicines are stored as well). The registry of the stock must be kept with the drugs in the safe, and at each time when such a preparation is taken out of the safe, the name, amount and the amount left in the safe must be recorded. The registry cannot be corrected, it must be filled in carefully and signed, which is the responsibility of the physician responsible for controlled drugs in any ward

The tasks of the staff responsible for medicines include checking on the expiry of pharmaceuticals stored in medicine cupboards and refrigerators, which should be checked weekly. Expired medicines have to be handled as hazardous waste. If any changes in pharmaceuticals occur before expiry, which suggest that the medicine cannot be used, or the medicine has been withdrawn, it has to be separated from the stock and disposed of. The adequacy of medicine and controlled drug storage is checked by the pharmacist on staff responsible for this task once a year.

Stored pharmaceuticals must be arranged in alphabetical order – for better organisation – and those expiring first should be arranged in the front. For medication safety, pharmaceuticals always must be kept in their original packages. Pharmaceutical containers are required not to contaminate or corrupt medicines. They can be capped, tight, hermetic and sterile. They can be made of glass, glazed porcelain or metal. Those medicines to be kept away from light need to be stored in dark bottles with light-protective coating or in light-protective cupboards. Medicines to be kept in a light place are stored in transparent bottles, in diffused light.

The storage temperature as specified by the manufacturer is indicated on packaging:

- at room temperature 15°–25°C,
- in a cool place 8°–15° C,
- in refrigerator 2°–8°C,
- in deep freezer below –15°C.

Note that medicines having been taken out of the cabinet to a bedside are forbidden to be repackaged in their original package.

In general it can be stated that concerning the expiry of magistral formulae the prescriptions of the Pharmacopoeia and the Formulae Normales have to be observed. Eye drops must be used within week of opening, while eye ointments within two weeks. Suppositories, pessaries and vaginal suppositories must be stored as instructed, in a cool place, protected form heat and moisture, in their original packaging.

Nursing tasks according to the route of administration

The route of administration of medication is determined by several factors such as the general condition of the patient, the primary disease, age, the properties of the medicine to be administered, or the psychological condition of the patient.

The most common routes of administration are the following:

- Oral administration
- Otological treatment
- Vaginal treatment
- Inhalation treatment
- Nasal treatment

- Parenteral dosage
- Ophthalmologic treatment
- Rectal administration
- Transdermal administration
- Vaginal administration

Oral (per os) administration of medication

The drugs prescribed by physicians are administered by the mouth most frequently, and there are medicaments which utilise the vascular bed of the oral cavity for faster absorption (e.g. sublingual medication). Solid forms of medicine (pills, capsules, etc.) lodge in the oral cavity for a short time, so adsorption is not significant, but in case of sublingual administration the whole amount of active ingredients are adsorbed here. The advantage of direct absorption from the oral cavity is that active ingredients are transferred directly to systemic circulation, thus avoiding first pass effect. The main criterion of oral administration is that the patient must be able to co-operate and swallow properly, that is, in case of e.g. unconscious or disturbed patients this route is not viable.

Nursing tasks prior to oral administration

In case of oral administration, besides the tasks under "assessment and anamnesis", also assess the condition of the patient's mouth (for any injuries, roughness, bleeding or sensitivity). Make sure that the patient is able to swallow the pill by testing swallowing with a little fluid.

Besides the tasks included in "patient education", inform the patient about the fact that medicines always need be swallowed with the appropriate amount of liquid. Do not crush coated pills to be dissolved in the intestines, because it hampers absorption. Powders and effervescent tablets must be dissolved in the prescribed amount of liquid and drunk immediately after dissolving. If the patient is prescribed to take sublingual or buccal drugs, draw attention to the fact that they must not be chewed and swallowed. For the safety of the medication and the patient, medicines must not be taken in a lying position; they must be taken either in a sedentary position or at least the upper part of the body should be elevated so that gravity can contribute to the progress of the medicament.

Preparation of equipment

- disposable gloves,
- medicine to be administered,
- drinking water,
- drinking straw,
- paper towel,
- tool for breaking the pill,
- knife (when necessary).

The process of oral administration of medication

Position the patient in semi-Fowler or sitting position. Place only one pill or capsule in the patient's hand at a time so that he can swallow it easily. Provide a sufficient amount of liquid; the bigger the pill or capsule, the more liquid the patient may need for taking it. Always ask the patient if he has managed to swallow the medicine, and in certain cases such as psychiatric patients it may be necessary for the nurse to check if the patient has swallowed the prescribed drug indeed; in this case ask the patient to open the mouth and check the oral cavity for any medicine left there.

Liquid medicines must be given after solid forms, and they can be dosed with calibrated spoons or oral syringe. Before sublingual or buccal administration the patient can be given a mouthful of water if the mucous membrane is too dry. In case of sublingual administration the medicine must be placed under the tongue, while in buccal administration between the cheek and the gum in both sides of the oral cavity.

Check the patient's condition and the fact if the administered medicine has achieved the desired effect cca. 20-30 minutes after administration.

Table 3. The process of oral administration of medication

	Steps	Explanation
1.	Survey the physician's prescriptions related to administration.	With this you will ensure the safety of medication.
2.	Prepare the room (hospital ward room, examination room) for the procedure, and inform the patient on the necessity and process of the procedure.	It can improve patient's compliance.
3.	Check for any allergic sensitivity in the documentation.	To prevent unnecessary allergic reactions
4.	Prepare all the equipment necessary for the procedure, and draw up the necessary amount of medicine in the manner described previously. Observe the basic rules of medication.	
5.	Carry out hygienic hand disinfection and put on rubber gloves.	In order to prevent nosocomial and cross-infections
6.	Position the patient in semi-Fowler or upright sitting position.	To prevent aspiration
7.	Administration of pills/capsules: Place only one of the prescribed pills or capsules in the patient's hand at a time. Ask the patient to take the pill or capsule in the mouth and swallow it with a sufficient amount of liquid. Stay beside the patient until all the medicine is taken. Check if the patient really has swallowed the prescribed pills or capsules.	It is easier to take only one piece at a time than several ones.
8.	Administration of liquid medicine forms: Liquid medicines must be given after solid forms. Pour the prepared solution in a cup and give it to the patient. For dosing manufactured liquid drugs use calibrated spoons (5 ml) or oral syringes (5 ml). Ask the patient to drink the whole amount.	
9.	Buccal and sublingual administration: If the mucous membranes are dry, offer a mouthful of water before administration. In case of sublingual administration, place the pill under the tongue. In case of buccal administration, place the pill between the cheek and the gum in both sides of the mouth. Avoid injured or irritated areas.	For better absorption Warn the patient not to swallow the pill but let it dissolve.
10.	Set the patient at ease.	To provide comfort
11.	Clean up the ward/examination room, observing the rules for the disposal and storage of hazardous waste.	
12.	Carry out hygienic hand disinfection.	In order to prevent nosocomial and cross-infections
13.	Record and document medication.	
14.	Check on efficacy cca. 20-30 minutes later.	In order to see if the desired effect has been achieved

Otological treatment

Otological pharmaceutical preparations may be liquid, solid or semi-solid in form. These medicines shall be transferred to the external auditory canal by means of dropping, spraying or insufflation, and the rinsing out of the auditory canal also may be necessary. It is important to note that in case of injured ears the medicament must be sterile. Otological medicaments include ear-drops, aerosol sprays, ear powders, ear rinse liquids and ear.

Nursing tasks prior to otological administration

Before the procedure survey the condition of the ear (the amount of ear wax, permeability of auditory canals, discharges). Consult the attending physician about the condition of the ear-drums in every case, since it determines the procedure.

Ear-drops must be heated to body temperature before use, since too cold preparations may cause the irritation of the labyrinth, the symptoms of which include e.g. nausea and dizziness.

Administration of ear-drops

The patient must be lying on the side, or in a sitting or in semi-Fowler position. If any discharge or cerumen can be found in the external auditory canal, it needs to be cleaned out carefully with a cotton swab, but care must be taken so that the discharge or cerumen could not to be pushed farther in. The external auditory canal can be straightened by pulling the auricle upwards and to the side. Keep the dropper at a distance of cca. 1cm from the auditory canal, do not touch the ear with it. After dropping ask the patient to remain in this position for about 3–5 minutes to prevent the solution from flowing out, and the nurse also may apply mild pressure on the tragus. In case of certain pharmaceuticals a cotton ball may be necessary to be placed to the opening of the auditory canal (which can be removed 15 minutes later).

Vaginal treatment

Vaginal treatment

Pharmaceutical preparations for vaginal treatment are used for a topical effect. Medicaments administered vaginally can include the:

- Vaginal suppository
- vaginal pill
- vaginal capsule
- vaginal solution
- vaginal emulsion
- vaginal suspension
- tablets for vaginal solution or vaginal suspension
- semi-solid vaginal preparation
- vaginal foam
- medicated vaginal tampon

Vaginal douche, irrigation

Aquatus system is a Hungarian invention developed for the treatment of mild inflammatory problems, but it also can be applied with the aim of prevention.

The adapter unit of the device can be attached to the shower pipe, and the device also contains a head, the handle containing the capsule, and a safety valve. The capsules used for rinsing are available with several active ingredients such as lactic acid gel, thyme, calendula (marigold), etc.

Nursing tasks in vaginal treatment

Before administration observe the condition of the vagina and the surrounding areas for any injuries, redness of the skin, oedema, bleeding, sensitiveness, discharge or unpleasant smell. Ask the patient if she has ever used an irrigator or vaginal douche, and if yes, how frequently and with what kinds of active ingredient.

Besides the aspects mentioned under "Patient education", draw attention to the importance of personal hygiene, and, if necessary, inform the patient about the proper use and cleaning of the applicator.

The process of vaginal administration

The patient must be brought into Sims' position before vaginal treatment.

In case of vaginal suppositories, apply lubrication on the tip of the suppository, then spread the labia with one hand, and move the suppository down to about 7–10 cm with your dominant hand. When using vaginal cream or foam, use an applicator for administration; fill it with the prescribed preparation. Move in the applicator to 5–7.5 cm, then deliver the medicine into the vagina by constantly pressing the plunger.

In case of a vaginal douche, rinse the device, then place the capsule in the handle, and open the tap – the water should be lukewarm. About 1500 ml saline solution is produced from the frontal part of the capsule, which is used for the rinsing of the walls of the vagina. The active ingredients are discharged from the capsule only then, and they flow onto the vaginal wall as well. The process itself lasts for approximately 1 minute, before and after that make sure that the device is cleaned in order to prevent infections. After the treatment ask the patient to stay in bed for 10–15 minutes.

Inhalation therapy

Inhalation therapy is applied in case of acute or chronic obstructive diseases of the airways, and it is aimed at enhancing expectoration and topical effect. During inhalation therapy a high concentration of pharmaceuticals can be achieved both in the airways and on the mucous membrane of the bronchi, therefore smaller doses are prescribed for treatment and less systemic side-effects are expected. In case of inhalation therapy the prescribed medicines enter the airways in aerosol form. The advantage of this kind of treatment is that the medicine is delivered directly to the target organs, i.e. the lungs. It is characteristically safe because fewer side-effects are expected. The process of the treatment is relatively simple, since patients and their relatives can acquire sufficient knowledge and experience in the method of inhalation and in controlling attacks (see the chapter on "Oxygen therapy").

Nasal administration

(Kürti 2009, Costantino 2007)

The nasal membrane is characterised by high permeability, thus it is an effective delivery route for achieving local effect either in acute or chronic treatment. Some researchers regard it as an alternative to intravenous administration since it provides a large surface for absorption, it is well vascularised and first pass metabolism can be avoided in this route as well. This route of administration is also advisable when the enteral system must be avoided for some reason, or in case of prolonged pharmaceutical therapy. Other advantages of nasal administration are that it is a non-invasive method which involves no pain, it is simple and quick to use, absorption is fast, and so is the effect. No decomposition takes place in the stomach, gastro-intestinal side effects can be avoided or reduced, and the risk of overdosing is decreased as well. Patients can administer the medicine by themselves, which also can be applied in case of swallowing difficulty. Nasal administration ensures better compliance, and it is also effective in case of nausea and sickness. Its disadvantages are that it may cause irritation, the active ingredients are on the nasal mucosa only for a short period, the enzymatic barrier affects efficacy and elimination is faster due to mucociliary clearance. Further complications may be caused by the sensitivity of the mucous membrane. Certain diseases such as rhinitis may affect absorption.

Tasks before nasal administration

In case of nasal administration of medicines the condition of the nasal mucosa must be examined first; concerning medication it is important that the nasal passages must be permeable, check if there is any contraindication of blowing the nose, if the patient's breathing is sufficient, if olfaction is appropriate, if nose bleeding has occurred and if yes, how frequently and what cause may be supposed. During the taking of the anamnesis facial sensitivity to pressure and the quality and quantity of any nasal discharge also must be included.

Besides the aspects mentioned under "Patient education", inform the patient about the proper position of the head so that medication could achieve its aim. Draw attention to the fact that preparations for nasal congestion are not advised to use longer than 7–10 days because tolerance may develop.

In case of nose-drops sterile methods do not need to be applied, however, under institutional circumstances the rules of asepsis and antisepsis must be observed in order to prevent cross-infections. Before the first use of nasal sprays they need to be activated by holding the spray vertically and pump into the air 2 or 3 times; thus an even amount of spray is delivered into the nasal passage.

The process of administering nasal drops/nasal spray/ nasal ointment

Have the patient sit or lie down and tilt the head backwards. If applying nose drops, draw up the solution into the dropper. Do not touch the patient's nose directly with the dropper. The preparation can be delivered to the passage by squeezing the end of the dropper. After finishing the process, the patient must hold the same position for a few minutes, and the patient has to avoid blowing the nose for the same time. In case of nasal sprays tell the patient to squirt one spray in the nasal passage simultaneously with inhaling, and not to blow the nose after the process. When using nasal ointments, squirt the ointment on one finger covered in rubber gloves, than apply it to the nostrils. The patient may be asked to sniff it slightly, or the alae of the nose can be pinched for better distribution. Non-desirable side effects may be expected even after intranasal administration; usually these are local symptoms such as the irritation of the mucous membrane or bleeding, ulceration or perforation rarely occurs. Hives, dermatitis or angioedema may be the symptoms of systemic reactions.

Ophtalmologic treatment

(Bozó 2009, Süveges 1998)

In ophthalmology, only sterile preparations are used which include liquid solutions, solid or semi-solid preparations. The active ingredients are diverse, e.g. antibiotics for bacterial diseases, corticosteroids for inflammations, antiviral medicaments, or antihistamines for allergic symptoms.

Tasks before administering eye-drops

Before administering eye-drops, enquire about any possible complaints such as redness, discharge, injuries, discomfort, as well as about their possible causes. The patient must be informed about the appropriate body position (sitting or lying position, with the head tilted slightly backwards). Regarding the therapy, it is crucial to teach the patient to apply eye-drops properly, but it raises difficulties if patients have to apply them without help. A survey has shown that a quarter of a patient group taking part in the survey, who had to administer eye-drops against glaucoma at their homes could not administer them, and even those who were successful delivered 40% more of the prescribed medicine to the eyes than prescribed. Another error having occurred was that the majority of the patients touched the dropper to the eyes thus increasing the risk of infection (Karmel).

The process of administering eye-drops/ointment

Position the patient in sitting or lying position with the head tilted slightly backward. Before administration place a sheet of gauze below the respective eyelid and pull the eyelid down slightly to facilitate medication. Avoid contact of the dropper with the patient's eye or eyelid since the eye-drop can lose its sterility and cannot be administered to further patients. If the patient receives more than one kind of eye-drops, there must be a lapse of 15 minutes between two administrations. When applying ointments, transfer the preparation on the surface of the eye with the help of the nozzle on the tip of the tube, then ask the patient to close the eyes for a few minutes. The patient's vision will be blurred for a while, so it is the nurse's task to take care of safety needs.

Rectal treatment

Rectal administration of medicines can have both local and systemic effects depending on the active ingredients

of pharmaceuticals, and certain preparations can be used with diagnostic aims as well. Its advantage is that first pass effect is evaded. Its disadvantage is that the amount of the absorbed active ingredient cannot be determined precisely, therefore it is not favourable in the treatment of acute cases. To eliminate the former, usual doses are increased by 20-30%.

Tasks before rectal treatment

Before rectal treatment ask the patient about any previous colorectal diseases, bowel habits, eating, exercise and medicine-taking habits. The nurse also has to examine the buttocks and the perianal area for any inflammation, piles, rashes or soreness; the patient also can be asked to "press" as when relieving, thus making internal piles or cracks in the anus visible.

Preparation of equipment

- Suppository, rectal solution,
- Lubricant gel,
- Disposable gloves,
- Clean towels,
- Draw sheet/rubber sheet for the protection of the bed.

The process of administering rectal suppositories

The patient must be positioned in Sims' position before rectal treatment. The suppository must be lubricated before insertion. Tell the patient to breathe evenly through the mouth and to relax the sphincters, then spread the buttocks with your non-dominant hand. Push the suppository to about 10 cm. If laxative is administered to the patient, warn the patient to remain lying until the stimulus for bowel movement occurs. When applying rectal solution, the end of the tube containing the solution must be pushed in the rectum, then the tube should be squeezed so that the solution can be transferred.

Table 4. Administering rectal suppositories

	Steps	Explanation
1.	Survey the physician's prescriptions related to administration.	To ensure the safety of medication
2.	Prepare the room (hospital ward room, examination room) for the procedure, and inform the patient on the necessity and process of the procedure.	It can improve patient's compliance.
3.	Check for any allergic sensitivity in the documentation.	To prevent unnecessary allergic reactions
4.	Carry out hygienic hand disinfection and put on rubber gloves.	In order to prevent nosocomial and cross-infections
5.	Position the patient in Sims's position. Cover the patient, leave the rectal opening uncovered only.	With the proper placement it is ensured that the medicine is administered to the right place. The anus becomes visible and the outer sphincters relax. Take care of the patient's privacy.
6.	Unpack the suppository from the foil covering. Lubricate the tip of the suppository. Apply water-soluble lubricant on your gloved index finger of your dominant hand. Ask the patient to take a deep and slow breath and relax the muscles of the sphincters. Spread the buttocks with your non-dominant hand. Gently push the suppository in the rectal opening, past the inner sphincter. Push along the wall of the rectum (about 10 cm in case of adults). Pull back your finger and wipe the rectal region with a towel. Pull down the glove inside out, and place it to the required waste container.	 The lubricant reduces friction between the suppository and the rectal wall when passing through the sphincter. The suppository forced through the closed sphincter may cause pain to the patient. To ensure comfort

7.	Administering rectal solutions: Unpack the tube from the foil. Uncap the tube. Place the tube, holding the tip of it downwards, to the rectum. Squeeze the solution out of the tube by pressing it with the thumb and the index finger. Keep the tube squeezed until it is completely removed from the rectum. The patient should not move from the previous position. Push the buttocks together for a few minutes to prevent leaking.	After administration, a small amount of the solution is normally left in the tube.
8.	If the suppository contains laxative or stool softener, place the nurse alarm to an easily accessible place so that the patient can ask for help with the use of the toilet or the bed-pan.	If the patient can call for help, it provides him with a sense of control over his bowel movements.
9.	Perform hand hygiene.	To reduce the number of micro-organisms
10.	Check if the suppository is still in place 5 minutes later.	The administration of another suppository may be necessary.
11.	Clean up the ward/examination room, observing the rules for the disposal and storage of hazardous waste.	
12.	Carry out hygienic hand disinfection.	In order to prevent nosocomial and cross-infections
13.	Record and document medication.	
14.	Check on efficacy 30 minutes later. (e.g. the elimination of sickness, bowel movements, stool)	Assess if the medicine has been efficient in eliminating the symptoms.

Transdermal patches

(Tiwary 2007, Soós 2002)

Transdermal patches have the active ingredients delivered into the blood circulation through the skin (transdermal drug delivery system, TDDS; transdermal therapeutic system, TTS) and provide systemic effect, however, their application is necessary throughout several days for a consistent drug level. Absorption through the patches is influenced by several factors, only molecules smaller than 500 Dalton can enter through the skin (Antal 2008). Usually nitro-glycerine, narcotic analgesics and various hormones are administered in the form of patches in the practice. Their advantages are that first pass metabolism of the liver is evaded by them, they are convenient and easy to use and provide a consistent plasma level. Their disadvantage is that irritation of the skin and dermatitis may occur if the place of administration is not changed from time to time.

Tasks in administering transdermal patches

Before applying a transdermal patch the nurse should check the respective area of the skin for irritation, rashes or injuries. Patches always must be applied on intact, clean and dry, and possibly hairless and unwrinkled surfaces. Both the patient and the nurse should be aware of the fact that the place of application must be rotated from time to time to prevent irritation. Besides the aspects mentioned above, the site of application must be selected with regard to the fact that neither clothing nor movement should cause discomfort. It is enough to clean the skin with soapy water, but do not apply the patch directly after washing or bathing, wait until the skin gets dry and its temperature decreases, but do not use body lotions or skin-protective preparations on the site of application. The patient should also know that he can have a shower or bath after applying the patch, but it should not be kept in water for a long time. Warn the patient that local heat increases blood circulation in the respective site, thus increasing absorption, therefore e.g. heating pads should not be applied near the patch.

The process of applying transdermal patches

Patches may be removed from their wrapping directly before use only. Pull the protective liner without touching the side of the patch contacting with the skin, then place the patch on the skin and press it firmly with the palm of your hand (Eichelberg 1989).

Nurses must be aware of the possible side-effects concerning patches with various active ingredients. In case of nitrate patches the most common side effect is headache which occurs at the beginning of the therapy but passes away after a few days, but a drop in blood pressure, orthostatic hypotension, drowsiness, dizziness and an increase in heart frequency also may occur. In case of analgesics, drowsiness, constipation,

bradycardia, low respiratory rates, low blood pressure and headache may occur.

Administering injections

By way of injections pharmaceuticals are delivered into the body evading the enteral canal; i.e. parenterally. The medicine is most often delivered between or under the layers of the skin, or in the muscles, or directly into the veins. Injecting is an invasive method therefore it is essential to observe the rules of asepsis and antisepsis when giving injections.

In choosing the site for injection the general condition and age of the patient and the amount of the medicine to be administered must be taken into account. The planned injection site should be checked for inflammation, swelling, infection or other changes in the skin. Do not administer injections in limbs in case of injuries involving paralysis or loss of functions, or in the presence of Cimino-shunts. The circulation of such limbs may be reduced, which can lead to the development of abscesses due to reduced absorption. For 2-4 hours following the injection monitoring is necessary for complications. If frequent injections are needed, their sites must be documented so that the site of administration can be rotated. This both reduces the patient's discomfort and the risk of complications (muscular atrophy, sterile abscess due to poor absorption) (Springhouse Corporation).

Tools for administering injections

Syringes

Nowadays mostly disposable plastic syringes are in use, but as safety stock, sterilisable and re-usable, combined metal and glass syringes are available as well. Syringes can be two-part or three-part; two-part syringes consist of a plunger and a barrel, while a seal ring is added to three-part ones. The cone or fitting (nozzle) is at the end of the barrel, to which the needle can be connected. The centric or eccentric fittings can be Luer-Slip and Luer-Lock types according to international patent, and there also exist catheter tip syringes the tip of which can be directly connected e.g. to nasogastric probes.

Syringes most often contain a tenth of millilitre and a minim calibration scale, the range of which is wide, between 0.25 and 450 ml. Syringes with a fixed volume are suitable for the safe measurement and administration of larger amount of liquids due to their size and calibration (e.g. 2 ml syringes can be used for up to 3 ml, 5 ml syringes to 6 ml, 10 ml syringes to 12 ml, 20 ml syringes to 24 ml). The size of the syringe is determined by the amount of medicine prescribed. For the injection of less than 3 ml low-dose syringes are required for accurate dosage (Beyea, Nicholl, Boros).

Such syringes should be used which are well distinguishable and identifiable concerning the method of injection, since besides traditional hypodermic needles there are syringes for oral, vaginal and rectal treatment as well.

Low-dose syringes

Syringes with a volume of max. 3ml are called low-dose syringes.

Insulin syringes

These may be used exclusively for the administration of insulin. They are usually available in 0.5 and 1ml of volume, but there exists a 2 ml version, too. The international unit of insulin is indicated on the syringe (1 ml=100 U). Available insulin syringes can contain 20, 30, 40, 50 or 100 units.

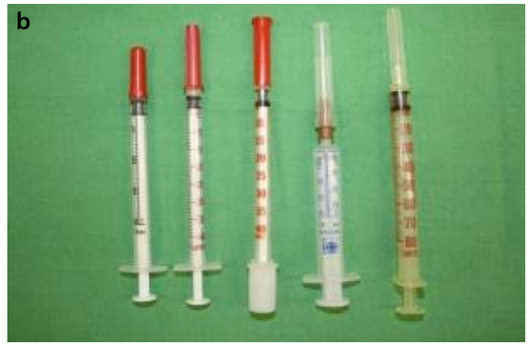
Tuberculin, heparin, and allergy syringes

They are available in 0.5 and 1 ml volumes. They are calibrated on one hundredth millilitre and sixtieth of minim scales for extremely accurate measurement. They can be used for skin tests, as well as for administering heparin and vaccines or low amount of paediatric doses, the loss is minimal.

High capacity syringes

Drawing up pharmaceuticals cannot always be performed with the above mentioned syringes (e.g. dissolving powder ampoules), and certain medicines cannot be administered in an amount of or less than 3 ml. Therefore larger-volume (5 – 10 – 20 – 30 – 50 – 60 – 100 ml and above)

Pictures 1. Injekciós fecskendők
a) Two- and three-part syringes, b) Luer Slip, Luer Lock and catheter tip syringes, c) Eccentric and concentric tip syringes



Pictures 2. a, b. Insulin syringes of various types

syringes also are available. 50–60 ml syringes are used e.g. with perfusors, and 100 ml syringes are used for artificial feeding.

Safety syringes

The use of safety syringes reduces the risk of needle-stick accidents, improves the safety of the healthcare staff, and it is a right of healthcare employees guaranteed by law in several countries. There are prefilled and not prefilled safety syringes. They can be retractable automatically or manually, and they are available with or without attached needles so as to provide an opportunity for the choice of needles. The advantage of safety syringes without needles is that the necessary needle size can be chosen according to the way of injection (e.g. subcutaneous or intramuscular) and the patient's parameters (e.g. age, weight). Another advantage is that there is no need to change the "routine" process. In case of automatically retractable syringes the needle is retracted automatically to the safety barrel after the administration of the injection and the release of the plunger. In case of manually retractable syringes the needle must be retracted to the safety barrel manually, or the barrel must be pulled down over the needle.

Prefilled syringes

Prefilled syringes for intravenous catheters

They are mostly used for flushing cannulae (physiological saline). With their use the multiple puncturing of the patient can be evaded, the risk of needle-stick injuries are eliminated, as well as the risk of contamination and dosage errors resulting from the drawing up of medicines.

Certain medicines (e.g. anticoagulants) are available in prefilled syringes equipped with integrated needles. When using such syringes, nurses must check if the dose in the syringe is identical with the prescribed dose and the redundant amount must be disposed of.

Administration PEN

An administration pen is a tool used to inject insulin (not exclusively) which is similar to a pen. Dosage differs individually. The advantages of pens include that they are portable,

Picture 3. Prefilled syringe

discreet in appearance, they are convenient to use even outside the home, they can save time because insulin does not need to be drawn up from ampoules, and it is easy to adjust the dose even in case of poor eye-sight and left-handedness. The disadvantages include that using a pen is more expensive than using separate syringes and insulin ampoules, they are "wasteful" since 1-2 units are lost before each use during the removal of air, and if some insulin is left in the cartridges which re not enough for the next dose, they have to be disposed of. It must be noted, too, that not all insulin types can be used in pens, and two different types of insulin cannot be used with the same pen only if they are pre-mixed in the same ampoule.

Pen types:

- Re-usable pens
- Disposable pens

There are several types of pens available on the market which differ in various features. When choosing the appropriate type, the following should be considered: how many units of insulin are available in case of a full cartridge; the largest dose that can be injected with the pen; how the adjustable units follow one another; how it is indicated if there is not a sufficient amount of insulin in the cartridge.

The parts of the device:

- Main part: it contains the dose selector or dial for adjusting the desired dose, the window or display shows the amount of the adjusted dose. A clicking sound at adjusting facilitates dosing for the visually impaired. The insulin can be injected with the injector button found on the tip of the main part.
- Insulin cartridge
- Cartridge casing or reservoir: the insulin cartridge is placed here
- Needle covered by an outer and an inner needle cap
- Pen cap

Spare insulin cartridges or pre-filled insulin pens should be kept in refrigerator until use, but they must not be frozen, thus they should not be kept near the freezer. If cartridges or pre-filled insulin pens are kept at a temperature below +2°C or at too high temperatures they must not be used. Actually used insulin cartridges or pre-filled pens should be stored at room temperature. If the short-acting insulin in the cartridge is diffuse, coloured, or the long-acting or mixed insulin preparation is clotted, white or flaky, frost-like precipitate can be seen in it even after dispersal, it must not be used.

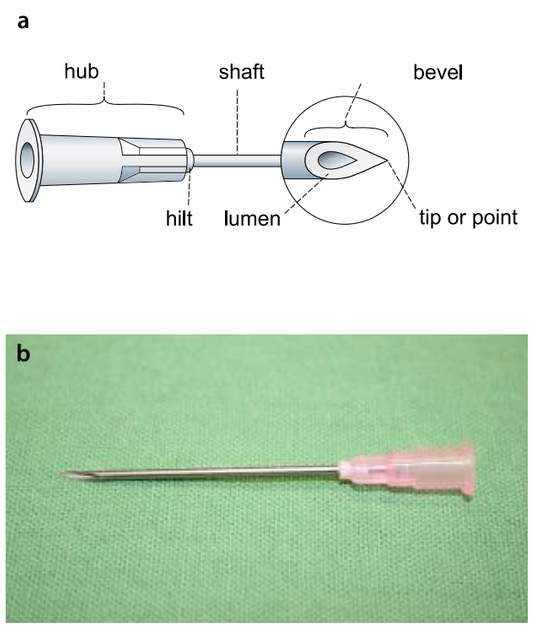
Needles

Injection needles

Injection needles consist of a transparent plastic (latex and PVC free) Luer lock connection (cone) to the syringe; a hollow stainless steel shaft with a silicon coating; and a needle tip. The bevelling of the tip depends on its function; there are short and long bevels, cone tips and blunt tips as well. Short bevelled tips can be used e.g. for intracutaneous and intravenous injections and for drawing up medicines, while long bevelled tips can be used e.g. for subcutaneous and intramuscular injections or for drawing blood. Blunt tipped needles or plastic cone tips can be used for drawing up from plastic vials in order to prevent needle-stick accidents. After drawing up the needle has to be replaced because it needs to be clean, dry and sharp. The needle used for puncturing the rubber cap may cause local tissue injury, and contamination or contact with the pharmaceutical during drawing up may increase irritation, and consequently the pain.

Even the cap of needles which have not been used should not be replaced; at the end of the procedure the tool should be disposed of immediately and carefully as hazardous waste.

Picture 4. a, b. Re-usable pen



Picture 5. a, b. The construction of needles

Take care so that the needle cannot drop in the patient's bed off the tray, since it means a risk of injury both for patient and nurse.

The size of the needle is indicated by Gauge (G); which is in correlation with the thickness, i.e. external diameter of the needle, that is, the bigger the indicated gauge, the smaller the diameter of the lumen of the needle. The desirable size of the needle depends on its function. For drawing up powder ampoules needles with a bigger lumen (usually 18 G) are used, while needles with a smaller lumen can be used for injections, depending on the viscosity of the liquid and the site of injection. The size of the needle is indicated by an internationally uniform colour code (The colour code may differ in some special cases – e.g. cylinder ampoule needles).

The length of the needle is indicated by inches (1 inch = 2.54 cm). The length of the needle (cca. between 0.5 and 2.5 inches or 13 and 63 mm) is determined by how deep and in what angle the medicine is intended to be injected. In the case of intramuscular injections the needle must be long enough to penetrate the muscle and for a quarter of the length of the needle stay outside the skin.

Safety needles

Today safety needles are available the use of which reduces the risk of needle-stick accidents occurring. The safety shield covering the whole needle can be activated manually by the thumb, or by touching it to any smooth surface. Safety needles can be attached to LuerLock and LuerSlip syringes as well. The process of drawing up and injection is the same as in case of traditional needles. Since the needle is not integrated in the syringe, different needles must be used for drawing up and injection. After injecting, the safety shield must be activated with the thumb or the index finger immediately.

Picture 6. Szűrővel ellátott tű (filter needle)

Tools for drawing up from glass ampoules and for filtering particles left from dissolving powder ampoules:

- Filter needle
- Wheel / syringe filter
- Filter Connector
- Filter Aspiration

Protective equipment

Disposable, not sterile gloves are necessary for the protection from the patient's body fluids, from medicine induced allergic reaction and to prevent the contamination of the medicine, thus in certain cases (e.g. cytostatic therapy) protective glasses and face mask may be required as well. Besides certain facilities prescribe the use of disposable aprons during the procedure of drawing up for the protection of the uniform, and also during the injection to reduce the risk of cross-infections between patient and nurse. It is also important to prevent body fluids and medicines left on the apron from contacting the nurse's skin after the procedure.

Preparation for injection

Tools for drawing up and mixing medicines

Several further tools facilitate the safety of preparation for injection (the replacement of needle use), the observation of the rules of asepsis and antisepsis, and thus the prevention of the contamination of sterile solutions. One the one hand, all these contribute to safe healthcare procedures (e.g. the prevention of needle-stick injuries), on the other hand, they reduce the risk of infection.

The pharmaceutical/solution can be transferred directly from one syringe to another with a syringe connector. Connectors without needles can draw up medicine from rubber-capped ampoules or they can be attached to cannulae; their advantage is that they close automatically if there is no syringe connected, so the blood cannot flow back. The solution can be transferred from the rubber-capped ampoules directly to the infusion bottle or to another rubber-capped ampoule with a fluid-flow adapter spike or a transfer spike (without using syringes or needles). Both connector types and the above mentioned fluid-flow adapters can be closed with a closing cone; syringe closing caps are used for closing syringes, while infusion spikes for closing infusion bottles. Syringe spikes can be used for drawing up from rubber-capped ampoules, filter straws are used with glass ampoules. Spikes are used for the flowing through of infusion/medicines, they are equipped with a closing lid and filter, therefore they can be locked after use and prevent contamination of the solution.

Drawing up injection from glass ampoule

Necessary tools:

- syringe with appropriate volume
- aspiration needle (lumen >19G, filtered, if possible), or straw
- prescribed glass ampoule
- ampoule file (if necessary)
- cotton balls, gauze pad
- tray
- disposable non-sterile latex gloves

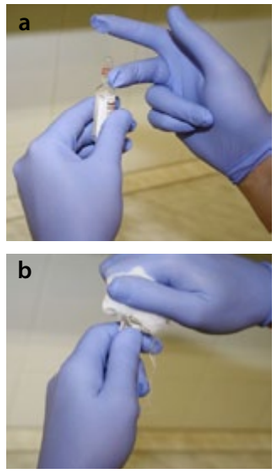
Drawing up injection from injection bottle

Necessary tools:

- syringe with appropriate volume
- aspiration needle (lumen >19G, filtered, if possible), or syringe spike or spike
- prescribed injection bottle
- tray
- disposable non-sterile latex gloves
- disinfectant

Table 5. Drawing up injection from glass ampoule

	Step	Explanation
1.	Survey the physician's prescriptions related to administration.	To ensure the safety of medication
2.	Prepare all the equipment necessary for the procedure, and check the expiration date of the drug.	
3.	Label the syringe (patient's name, name and amount of drug, nurse's signature).	For the safety of medication
4.	Perform hand hygiene and put on rubber gloves.	In order to prevent nosocomial and cross-infections
5.	Before opening the glass ampoule, pat its top with one finger slightly but firmly. Place gauze dressing on top of the ampoule and break off the top with the fingers of your dominant hand; use the file if necessary.	By this, the liquid flows off the neck of the ampoule. To prevent injury of the fingers by splinters of the broken ampoule. If a colourful stripe or dot can be seen on the neck of the ampoule, it can be broken without using an ampoule file.
6.	Drive the needle in the middle of the mouth of the ampoule, but make sure that the needle is not in contact with the outer edge of the ampoule, then draw up the prescribed amount of solution. Use a filter needle if possible. If you use a straw, attach it to the syringe and place the other end in the ampoule. Make sure that neither your hand nor the straw is in contact with the outer edge of the ampoule.	The outside of the ampoule is not sterile, so if the needle contacts it the solution may be contaminated. Filter needles can prevent tiny splinters from getting into the solution. When using straws, there may be a risk of drawing up splinters from the broken ampoule. However, its advantage is that there is no risk of needle-stick injuries.
7.	After drawing up the prescribed amount of drug, pull out the aspiration needle or straw from the ampoule.	
8.	Place the equipment needed for medication on a tray. Place the ampoule of the drawn medicine next to the syringe. It may be disposed of only after complication-free administration. Any solution left must not be kept for later use.	For the safety of medication
9.	Clean up the ward/examination room, observing the rules for the disposal and storage of hazardous waste.	
10.	Perform hand hygiene.	In order to prevent nosocomial and cross-infections



Pictures 7 a, b, c. Drawing up drugs from glass ampoules

Pictures 8. Drawing up medicine from an injection bottle

Table 6. Drawing up injection from injection bottle

	Steps	Explanation
1.	Survey the physician's prescriptions related to administration.	To ensure the safety of medication
2.	Prepare all the equipment necessary for the procedure, and check the expiration date of the drug.	
3.	Label the syringe (patient's name, name and amount of drug, nurse's signature).	For the safety of medication
4.	Perform hand hygiene and put on rubber gloves.	In order to prevent nosocomial and cross-infections
5.	Remove the metal or plastic wrapping, then disinfect the surface of the rubber cap and wait for the allotted contact time.	To ensure sterility of the solution during drawing up
6.	Pick up the prepared syringe and needle, use filter needle or syringe spike if possible. Pull back the plunger of the syringe so that the appropriate amount of air accordant with the prescribed amount of solution can get into the syringe.	Filter needles can prevent fragments of the rubber cap from getting into the solution. The advantage of syringe spikes is that they prevent the risk of needle-stick injuries. This amount of air causes overpressure in the infusion bottle, thus the solution can get into the syringe without pulling back the plunger.
7.	Drive the needle or syringe spike through the centre of the rubber cap, then press the air into the bottle. In case of syringe spikes, drive the piercing spike through the rubber cap.	The centre of the rubber cap is thinner, so it is easier to pierce through.
8.	Turn the injection bottle upside down, and make sure that you grip the syringe and needle or syringe pike firmly and that their end is kept in the liquid.	Overpressure in the bottle may push the plunger back.
9.	Let the air-pressure fill the syringe with the prescribed amount of liquid gradually. If necessary, pull back the plunger to draw up the necessary amount. In case of using a spike, open the covering lid, connect the syringe, then turn the bottle upside down and draw up the required amount of liquid.	Overpressure in the bottle pushes the liquid into the syringe.

10.	Tap the syringe slightly so that air bubbles flow up, then plunge the air on the surface back into the bottle.	To ensure the proper amount of medicine
11.	At the end of the procedure, pull out the syringe spike or the syringe by the barrel from the bottle. If you use a spike, close the lid.	If you have not used up the whole content of the bottle, indicate the date of opening on the bottle.
12.	Place the equipment needed for medication on a tray. Place the bottle of the drawn medicine next to the syringe. It may be disposed of only after complication-free administration. Any solution left must not be kept for later use.	For the safety of medication
13.	Clean up the ward/examination room, observing the rules for the disposal and storage of hazardous waste.	
14.	Perform hand hygiene.	In order to prevent nosocomial and cross-infections

Most common injection methods

(Duque, Chagas 2009, Florence, Attwood)

The most common injection methods are intradermal/intracutaneous (ID, IC), subcutaneous (SC), intramuscular (IM) and intravenous (IV) injections. Mostly aqueous solutions are used for subcutaneous injections, but oil solutions also can be injected, however, in this latter case there is an increased risk of abscess formation. For intramuscular injection both aqueous and oil solutions can be used, while only aqueous solutions can be used for intravenous injections.

Further, special injection methods include intra-arterial, intrathecal (into the subarachnoid space), intra-articular (into joints) and intracardiac (directly into the heart) injections.

Several factors must be taken into account before administering injections, which are essential regardless of the site and method of injections. Such a basic rule is that injections can be administered only in intact sites, and the risk of injuries caused by the sight of blood or the needle, or the idea of getting injection, and that would manifest in vertigo or syncope, also must be assessed. It is also essential to use appropriate equipment (syringes and needles) throughout the whole process; e.g. different needles for aspiration and for administering the injection.

As for injection solutions, oil and aqueous preparations can be distinguished. In general it can be said that oil solutions are used in case of intramuscular, while aqueous solutions can be used for any methods.

Intracutaneous /intradermal (IC/ID) injection:

In case of intracutaneous injection the injection is administered between the layers of the skin. The absorption of the injected substance is slow, since the vascularity between the layers of the skin is poor. The aim of this method of injection is to achieve local reaction, primarily with diagnostic aims (e.g. allergy or tuberculin test, local anaesthesia). The angle of injection can be 5-10-15 °, and then the small amount (0.1-0.2, 0.5 ml) of active ingredient is to be injected slowly between the layers of the skin. During the process the surface of the skin will swell slightly. The site of the injection must not be rubbed or massaged after injection in order to prevent irritation caused by the solution and to prevent the solution from being transferred to the subcutaneous tissue.

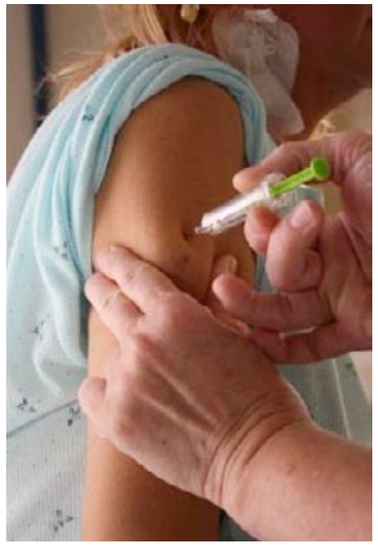
Subcutaneous injection (under the skin, sub-q, SC, SQ)

Usually 1–2 ml of pharmaceutical is delivered to the adipose tissue under the skin by subcutaneous injection. This way the medicine will absorb slowly, consistently and continuously due to the poor vascularity of the subcutaneous tissue. Injections involve relatively little pain, and rotating the sites of administration according to instruction provides opportunity for long-term application of the method. The site of administration should be rotated for better absorption and in order to avoid damage to the tissues.

Sites for subcutaneous injection:

- Upper arm
- Belly
- Thighs
- Lower part of the back
- Upper part of the back

Consequently to all these, subcutaneous injections are ideal for the insulin therapy of patients suffering from diabetes mellitus, since the absorption of the medicine is gradual, therefore there is no risk of hypoglycaemic coma resulting for fast absorption. Insulin injections must be administered several times a day, regularly and for a prolonged time. Besides insulin, heparin, certain vaccines, interferon and narcotics also are administered by subcutaneous injection. The site of administration also depends on the medicine to be injected, e.g. in case of heparin the primary sites are located 5cm below, or to the left/to the right from the navel (Lippincott, 2008).



Picture 9. Administering a subcutaneous injection

Traditional subcutaneous injection is injected under the skin, which is pinched with the thumb and the index finger and then lifted, at an angle of 45 degrees (Thow és Home 1990). After driving in the needle, inject the medicine slowly. Do not rub the site of the injection because bleeding may occur following anticoagulant injections, and it also may cause fast absorption of insulin, which may lead to hypoglycaemia.

The skin needs to be pinched and lifted to remove it off the muscle under the skin, so that the risk of erroneous intramuscular injection can be reduced. The risk of the latter is the highest in case of injecting under the skin of the belly and the thighs, especially those of lean or thin patients. Intramuscularly administered insulin may lead to hypoglycaemia due to fast absorption, while anticoagulants may cause local oedema or systemic haemophilia. Hypoglycaemia cannot only be caused by erroneous intramuscular injections; the absorption of insulin may differ in various sites (Peragallo-Dittko 1997).

Patient education

The efficiency of the pharmaceutical preparation also is affected by the temperature of the patient's skin and that of the preparation. Preparations for subcutaneous injection usually must be stored in refrigerator, but they should be taken out of the refrigerator 30 minutes before their administration. Pain after injection can be relieved with 2-3 minutes of local cooling, and it also reduces the risk of reddening, itching and haematoma.

The process of subcutaneous injection

Necessary tools:

- tools for drawing up the medicine
- tools for the administration of the medicine:
  - syringe with the prescribed solution
  - injection needle – 25–26 G, ½, 5/8, ¾, 1 inch (13–25 mm)
- disposable non-sterile latex gloves
- skin disinfectant
- cotton ball, gauze dressing sheets
- disposal tray

Table 7. The process of subcutaneous injection

	Steps	Explanation
1.	Survey the physician's prescriptions related to administration.	To ensure the safety of medication
2.	Prepare the room (hospital ward room, examination room) for the procedure, and inform the patient on the necessity and process of the procedure.	It can improve patient's compliance.
3.	Check for any allergic sensitivity in the documentation.	To prevent unnecessary allergic reactions
4.	Prepare all the equipment necessary for the procedure, and draw up the necessary amount of medicine in the manner described previously. Observe the basic rules of medication.	
5.	Carry out hygienic hand disinfection and put on rubber gloves.	In order to prevent nosocomial and cross-infections
6.	Position the patient; sitting or lying position is the most appropriate.	
7.	Free the site of injection from clothes etc., and disinfect the skin.	In order to prevent nosocomial and cross-infections
8.	Pinch the skin slightly with the thumb and index finger of your non-dominant hand on the site of injection, then drive the needle firmly, with one movement, at the appropriate angle (45-90°) and to the appropriate depth.	

9.	Hold the lower part of the barrel of the syringe firmly with your non-dominant hand. Put your dominant hand on the plunger, and inject the solution.	To support the syringe safely so that it cannot move or slip
10.	Pull out the needle and place a cotton ball onto the site of the injection, but so not rub the site.	Rubbing may lead to too fast absorption of insulin, or to bleeding in case of anticoagulants.
11.	Check on the patient's condition if it is necessary to keep the patient lying or he can leave on his own.	To prevent collapses related to injections.
12.	Clean up the ward/examination room, observing the rules for the disposal and storage of hazardous waste.	
13.	Perform hand hygiene.	In order to prevent nosocomial and cross-infections
14.	Document the medication.	
15.	Monitor the patient for 15–30 minutes after the administration to check if any side effect or allergic reaction occurs.	

Intramuscular injection (IM)

In case of intramuscular injection the solution is delivered to muscular tissue. Relatively high amounts of medicine can be administered this way, the absorption of which is relatively faster than in subcutaneous tissue due to the good vascularity of muscular tissues. This method can be applied if the amount of the injected liquid does not exceed 5 ml. It is recommended to divide the medicine over this limit, and to administer it at two different sites. Research has shown that absorption is more sufficient and the risk of complications (e.g. pain, injection abscesses) is reduced if the injected substance is divided and administered not only at one site even if the amount is only 3–4 ml. The recommended angle of injection is 90 degrees, but some sources recommend the angle to be between 45 and 60, or between 72 and 90 degrees (Malkin 2008).

Due to a significant rise in the number of obese patients extra attention needs to be paid to choose the site of the injection, the length of the needle and the technique of the injection (angle, depth) properly. Inappropriately chosen needle size and/or injection site due to neglecting the fact of obesity more often causes failure of intramuscular injections in case of female patients (partly because of the typically thicker fat tissue of the buttocks, but according to certain studies even in case of injections into the deltoid muscle the rate of unsuccessful IM injections is 50% in case of women) (Zaybak et al 2007).

The recommendations for the amounts of liquid injected to different muscles groups are in relation with the weight of the respective group. Patients tolerate a higher amount of medicine administered into muscles of bigger weight better, however, there are several other factors (e.g. the ingredients of the medicine, pH). Recommended amounts need to be considered critically, because little methodologically justified research is available in this field. When choosing the site of injection, the amount of the injected medicine, the body weight of the patient (in some areas there is unproportionately more fat tissue than in other sites) and possible complications resulting from the location of the respective muscles must all be taken into account. Concerning dorsogluteal injections it has to be emphasised that the sciatic nerve and the superior gluteal artery are adjacent to the site of injection, therefore the risk of injury of nerves and arteries here is the highest. Absorption is poorer from this muscle, and the thickness of the adipose tissue may vary significantly. Therefore more and more publication recommends the choice of other sites for administration (WHO 2004).

In case of adults all sites for intramuscular injection can be selected. Besides the amount of the injected liquid and the body weight of the patient, it is important to consider the absorption characteristics of different muscle groups, the thickness of adipose tissues, and the frequency of complications in the respective muscle. The risk of complications is the highest in case of dorsogluteal injections. Injections administered into the deltoid muscle or the anterolateral thigh muscle have a smaller risk, but even less complications are expected if the nurse administers the injection in the ventrogluteal muscle. Consequently, the primarily recommended site for adults is the ventrogluteal muscle, however, the majority of practising nurses still choose the dorsogluteal muscle as the site of injection.

Possible sites for intramuscular injections:

- Ventrogluteal region
- Dorsogluteal region
- Deltoid muscle
- Vastus lateralis
- Rectus femoris

In case of children 5/8 inch (16 mm) long needle, while in case of adult patients minimum 21G, 1 inch (25 mm long) green or 23G, 1½ (38 mm long) blue needle is required so as to the length of the needle can be sufficient for penetrating the subcutaneous adipose tissue and the injection is administered at appropriate depth (i.e. into the muscle). The choice of needle size depends on age, sex and the thickness of subcutaneous adipose tissue.

Traditional method

According to the traditional method the skin has to be strained in order to reduce sensitivity of terminal filaments, and the needle must be inserted at 90 degrees, as if a dart was thrown (Stilwell 1992).

Air-lock/air bubble technique

With this technique a small amount of air (0,3-0,5 ml) also is drawn up together with the medicine, which is injected after the injection of medicine, thus emptying the needle and preventing the medicine from being delivered into the subcutaneous tissues.

Z-track technique

The nurse pulls the skin and the subcutaneous tissues to one side by 2.5-3.5 cm and keeps it in this position until the removal of the needle. After the localisation of the intended site, the nurse must be able to insert the needle precisely even after moving the skin. The drug delivered into the muscle is closed in the muscle, thus preventing the medicine from leaking back into the subcutaneous tissue and the skin.

Administering intramuscular injections

Pull the skin and the subcutaneous tissues to one side by 2.5-3.5 cm with your non-dominant hand and keep it in this position until the removal of the needle. Warn the conscious patient before injecting the drug. Ask the patient to breathe through the mouth and relax the muscles to reduce muscular resistance and tension. Keep the pulled skin aside until the needle is removed. Insert the needle at 90 degrees with a quick thrust. Make sure that the needle has not entered a blood vessel by aspirating the syringe. To make sure, maintain aspiration for a few seconds (especially in case of needles with a smaller lumen). If any blood appears in the syringe, retract the needle and dispose of the syringe with its contents, then prepare another injection which has to be administered in another site. Before retracting the needle, make sure that the syringe is completely empty (that is, both the medicine and the air required for the air-lock have been injected). Apply mild pressure and cover dressing on the site of the injection if necessary, but do not rub it because it may cause the medicine to leak through the course of the needle. (Beyea, Nicholl 1995). Retract the needle, then release the skin and tissue pulled aside immediately. In order to prevent constant pressure, make sure that the patient does not wear tight clothes over the site of the injection.

Table 8. The process of Intramuscular injection

	Steps	Explanation
1.	Survey the physician's prescriptions related to administration.	To ensure the safety of medication
2	Prepare the room (hospital ward room, examination room) for the procedure, and inform the patient on the necessity and process of the procedure.	It can improve patient's compliance.
3.	Check for any allergic sensitivity in the documentation.	To prevent unnecessary allergic reactions
4.	Prepare all the equipment necessary for the procedure, and draw up the necessary amount of medicine in the manner described previously. Observe the basic rules of medication.	
5.	Carry out hygienic hand disinfection and put on rubber gloves.	In order to prevent nosocomial and cross-infections
6.	Position the patient according to the site of the injection.	
7.	Localise the exact site of the injection, then disinfect the skin.	In order to prevent nosocomial and cross-infections
8.	Ask the patient to breathe through the mouth and relax the muscles. Warn the conscious patient before injecting the drug.	To reduce muscular resistance and tension, because tense muscles increase the painfulness of the process.

9.	Hold the syringe between the thumb and index finger of your dominant hand as a dart, and insert the needle to the intended site at 72-90°. (If you apply the Z-track technique, before administering the injection, pull the skin and the subcutaneous tissues to one side by 2.5-3.5 cm and keep it in this position until the removal of the needle)	
10.	Make sure that the needle has not entered a blood vessel by aspirating the syringe. If any blood appears in the syringe, retract the needle and dispose of the syringe with its contents, then prepare another injection which has to be administered in another site.	
11.	If no blood appears in the syringe, inject the medicine into the muscle slowly, at 1 ml/10 second. It enables the muscular fibres to dilate and the solution absorbs at an appropriate rate.	
12.	Before retracting the needle, make sure that the syringe is completely empty (and if the air required for the air-lock has been injected). Wait for 10 seconds before retracting the needle so that the drug can absorb and will not cause irritation at the site of injection by leaking out.	
13.	Apply mild pressure and cover dressing on the site of the injection if necessary, but do not rub it because it may cause the medicine to leak through the course of the needle.	
14.	Retract the needle, then release the skin and tissue pulled aside immediately (in case of Z-tract technique).	
15.	Apply dressing on the site of the injection if necessary, but do not apply massage.	
16.	Check on the patient's condition if it is necessary to keep the patient lying or he can leave on his own.	To prevent collapses related to injections.
17.	Clean up the ward/examination room, observing the rules for the disposal and storage of hazardous waste.	
18.	Perform hand hygiene.	In order to prevent nosocomial and cross-infections
19.	Document the medication and site of administration	
20.	Monitor the patient for 15-30 minutes after the administration to check if any side effect or allergic reaction occurs.	

Administering intramuscular injections

Necessary tools:

- tools for drawing up the medicine
- tools for the administration of the medicine:
  - syringe with the prescribed solution
  - injection needle – 21–23 G, 5/8–2 inch (16–50 mm)
- disposable non-sterile latex gloves
- skin disinfectant
- cotton ball, gauze dressing sheets
- sticking plaster
- disposal tray

Injection complications

- pain
- redness of the skin
- swelling
- itching
- infection
- nerve injury
- bleeding/haematoma
- change of colour of the tissues
- abscess resulting from injection
- pain
- injection site fibrosis
- allergic reaction (anaphylactic reaction)
- breaking of the needle between the tissues
- Nicolau syndrome

If you recognise any symptom of complication, notify the attending physician and document the symptoms.

Reducing pain

Several techniques and methods are known for reducing pain during and after injections. The primary task of the nurse is to inform the patient about the process and to maintain communication continuously, thus reducing the patient's anxiety and sense of fear, and enhancing compliance. Another option is to apply manual pressure on the site of injection for about 10 seconds after the administration, or to apply freeze spray. The choice of the appropriate size needle is essential since it affects the degree of pain obviously, the selected needle also has to be long enough to reach the muscular tissue, and there is less pain after using needles with smaller lumen, since less pressure is needed for the injection. The positioning of the patient also has an influence on pain, the selected muscle must not be tense. In case of regular therapy, the rotation of the sites injected also can reduce pain. The angle of insertion is significant, too, by injecting at 90 degrees, shearing force is reduced, and so is the pain. If the dose is more than 3-4 ml, it is advisable to divide the drug and administer it to different sites so that the pressure felt at injection will not be so acute.

Whatever the route of the injection, it must be administered only on intact skin surface. It is important to make sure that the aspiration needle has been replaced with an injection needle. Before administration the patient needs to be positioned appropriately, since it is an invasive method, the patient must be sitting at least. The nurse also has to assess the risk of accidents related to the intervention (if the patient is inclined to vertigo or syncope), for this also is a determining factor in positioning.

The cleaning of the injection site with a cotton swab soaked in alcohol reduces the mount of bacteria, however, the necessity of disinfection is debated by certain studies. Alcoholic disinfection before injection may cause the skin to harden, and, according to some views, it is enough if the patient's personal hygiene is sufficient and the nurse observes the rules of hand hygiene and asepsis. (Workman 1999, Royal, Marsden 2004).

If skin disinfection is performed, apply an alcoholic towel on the surface of the skin for 30 seconds, then let the skin dry for at least another 30 seconds (time of action), otherwise the process will be ineffective (Simmonds 1983). Besides this, if the injection is administered before the skin dries, it will increase pain since the penetration of the needle involves a stinging sensation and irritation, and bacteria will not become inactive, therefore the risk of infection will not be reduced at the site of injection.

Intravenous injection (IV)

Intravenous injection can be administered through secured venous access or without it. In the following, the form of intravenous injection will be described where no secured venous access is available.

In case of intravenous route, the drug is delivered from the site of administration directly to the blood circulation. We cannot talk about absorption here, since absorption means the transfer of the drug from the site of administration to the blood-stream. Drugs have an immediate effect in case of intravenous injection. The indications for its application include rapid effect, if absorption is unsure for some reason, or if considerable irritation or even fast metabolisation occurs in case of per os administration. The main risk in using the intravenous route is overdosing, since there is no way to remove the drug quickly. As a general rule, the prescribed medicine must be injected slowly. If any kind of undesirable reaction occurs, the administration must be interrupted immediately! However, certain active ingredients can be administered intravenously only, since they cause necrotic tissues and pain at any other sites.

The administration of intravenous injections

Ask the patient to sit or lie down. The most commonly chosen veins as sites for intravenous injection are v.mediana cubiti, v.cephalica, and the veins of the dorsal hand and foot. The site must be free from all clothing. If the vein of the elbow-joint is chosen, support the patient's arm on a solid surface. Stretch the elbow at 150°–180°.

Aspirate the prescribed medicine and remove air from the syringe. Apply a tourniquet on the limb proximally from the intended site. Pull the skin above the vein by 1–2 cm distally from the site, parallel to the vein, with the thumb of your non-dominant hand. Hold the needle in your dominant hand with the bevel up, at 30–45° to the skin, parallel to the course of the vein. Insert the needle and push the needle forth in the vein to about 1cm. Check the positioning of the needle by aspirating the syringe; if blood flows unobstructed, the needle is in the proper place. Remove the tourniquet off the patient's arm with your non-dominant hand. Inject the drug drawn in the syringe during 30-60 seconds. Pick up a gauze dressing sheet with your non-dominant hand, and place it on the skin carefully at the puncture point. Retract the needle from the vein and apply pressure on the site for about 2 minutes, then apply sticking-plaster.

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21. The System and Maintenance of Water, Electrolyte and Acid-base Balance

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Anatomical and physiological bases

It is important to summarise the blood vessels opening into and coming from the heart chambers, and the system of the small and large circulatory system for the review of the topic.

The atria are located in the upper part of the heart with four chambers while the ventricles are in its lower part. Clearly venous blood flows into the right atrium of the heart (atrium dextrum) in adults. The upper and lower main collecting vein (vena cava superior and inferior), and the collecting vein from the heart's own veins, the coronary sinus opens into it. It is separated from the right chamber (ventricle dexter) by the tricuspid valve (valve tricuspidalis). The truncus (artery) pulmonary, which supplies the venous blood into the lungs for the purpose of externalrespiration, starts from the right ventricle. The blood refreshed in the pulmonary circulation flows into the left atrium of the heart (atrium sinistrum), which contains fresh arterial blood consequently, with the help of 4 veins pulmonalis. Vessels are named after their orientation relationship to the heart, rather than on the basis of the blood in them. So every vessel which starts from the heart (e.g. arterial / truncus pulmonary which carries blood rich in CO_2) is an artery, and every blood vessel which carries blood to the heart (e.g. pulmonary vein, which carries oxygenated blood) is called vein. The left atrium is separated from the left chamber (ventricle sinister) by the dual-flap mitral valve (valva bicuspidalis also known as valva mitralis). The aorta, the largest artery in thebody starts from the left chamber of the heart. At the starting-point of both the aorta and pulmonary artery in the heart pocket, also known as crescent-shaped valves (semilunar valve) can be found to prevent the backflow of blood into the chamber. So blood rich in oxygen can be found in the left side of the heart.

The vessel section from the left ventricle to the right atrium is called the large circle of blood. The aorta starting from the left ventricle is divided into 3 sections, the ascending aorta (aorta ascends), aortic arch (arcus aortae) and the descending aorta (aorta descends) which has chest and abdominal sections.

The arterial branches, the detailed description of which is unnecessary in this chapter, supplying some areas with blood directly start off from the upper branches. However, it is necessary to discussthe main blood vessels involved in the blood supply of the upper and lower limbs.

The upper limb receives its blood supply from the subclavian artery (a. subclavia). From this come the arteries running on the upper arm, axillary artery (a. axillary) and branchial artery (a. brachial), and then run into the arteries, ulnar artery (a. ulnar) and radial artery (a. radial) on the forearm.

The lower limb receives its blood supply from the external iliac artery (a.iliaca extern) not directly coming from the branching of the abdominal aorta. Femoral artery (a. femoral), which continues in popliteal artery (a. poplitea), comes from the direct extension of this. Tibial arteries (a. tibialis) and dorsalis pedis artery (a. dorsalis pedis) provide the blood supply of the foot and leg.

It is important to mention the system of the large veins leading to the atrium of the right side of the heart (v. cava superior et inferior) as well. The vena cava superior collects the following blood vessels:

- Internal jugular vein (collects the venous blood of the brain and the inside of the skull)
- External jugular vein (collects blood from the head and the muscles and the skin of the neck)
- Subclavian vein (collecting area: the upper limbs, upper chest, breasts, underarms)
  - Cephalic vein (v. cephalica) and basilic vein (v. basilica), the superficial veins of the upper limb, which are of practical significance, their connecting section in the cubital fossa is median cubital vein (v. cubiti median – connecting elbow vein), which is the most frequent location of intravenous injections and blood sampling. The arteries are surrounded by two veins on the forearm, their branching corresponds to the arteries
- Brachiocephalic vein, which develops at the flow of internal and external jugular veins (v. jugular interna et externa), and subclavian vein (v. subclavia).

The inferior vena cava is made up of venous elements of abdominal organs and lower limbs.

The vessel section from the right chamber to the left atrium is called the small circle of blood. The pulmonary artery leads the blood rich in carbon dioxide from the right chamber, shortly after taking its source it branches into the right and left lung. Entering the gate of the lung they follow the run of bronchi, and finally they form a capillary network on the surface of the alveoli. There is a thin membrane between the epithelial cells of the alveoli and endothelial cells of the capillaries, through which

the gaseous exchange occurs by diffusion, i.e. the exchange of the oxygen in the alveolar space and of carbon dioxide in the capillaries. 2-2 pulmonary veins from the collecting blood vessels leave through both lung gates and carry the oxygen-rich blood to the left ventricle of the heart.

The wall of blood vessels is three-layered, its inner part is the tunica intima (intestinal mucosa), its middle layer is the tunica media (muscular layer), while its outer layer is the tunica externa, in which its own vessel networks supplying blood vessels, nerve endings and smooth muscle bundles can be found. Structural differences can be observed between the arteries and the veins, for example valves are formed from the endothelial cells of the inner layer to control the flow of blood as well as the tunica externa layer is thicker in case of veins than in case of arteries. The middle muscular layer is thicker in arteries.

Types of intravascular cannulae (Vascular Access Devices):

The peripheral catheter (short)

The cannula is less than 3 inches (7.5 cm) long. Different types of short peripheral cannulae can be distinguished by their shape, and various sizes are available similarly to the needles, marked with colour-codes. A metal needle longer than the cannula, at the end of which there is a blood chamber to track the location of the needle, can be found in the cannulae for puncture. A cannula which can be inserted in the peripheral veins of the arm and the leg is suitable for short-term use. A cannula can be used during the interval of 48 - 96 hours. According to some literature data, a peripheral intravascular cannula can be used on one side up to max. 72 hours so that the risks of phlebitis, perivenous infiltration and infection can be reduced. (Vanek 1997).

The peripheral short cannulae have four main types, the cannula with injection port, the winged, the pen-type and Y-type cannulae.

The smaller the diameter of the cannula selected for the infusion therapy the better the blood flow at the end of the cannula is, so the dispersion of the solution will be more effective and it will be less irritating to the vein wall. Products harmful to the vein wall (e.g. chemotherapeutic products) and hyperosmotic solutions cannot be injected into the veins with a small diameter. Cannula with a greaterdiameter should be selected for highly viscous solutions or products (e.g. red blood cell concentrate).

The indications for the use of peripheral short cannulae:

- The need for intravenous medication
- The need for intravenous fluid replacement
- Administration of blood products
- Hypovolaemia

Contraindications for the use of peripheral short cannulae:

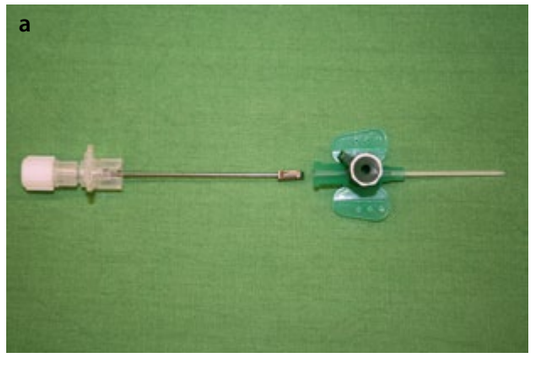
- Inflamed or damaged skin surface
- Burned skin surface
- Limb oedema
- Diagnosed venous thrombosis, obstruction in the given section of the vessel

The potential complications of the use of peripheral short cannulae

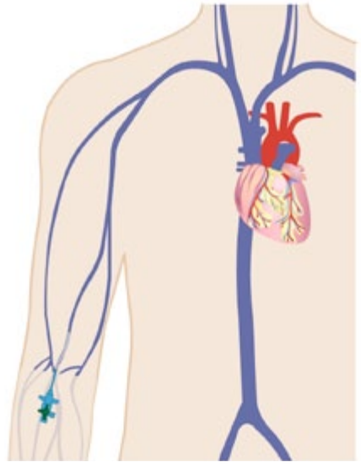
- (thrombo)phlebitis
- Extravasation.
- Infection
- Vein perforation, bleeding
- Development of thrombus
- Air embolism
- Accidental arterial puncture

Besides the needles with active and passive safety systems, described in connection with injection, short peripheral cannulae equipped with active or passive safety features are also available.

During cannulation of peripheral short cannulae first the veins of the hand – on the non-dominant hand - and then the forearm, elbow joint veins, and finally the area above the elbow, the upper arm are preferred. In case of cannulae placed in the elbow joint



Pictures 1. Peripheral cannula equipped with passive safety system



(cubital fossa), it should be anticipated that it may be uncomfortable for the patient, and the cannula is likely to break, so the infusion flow may be blocked (Lippincott Williams &Wilkins)

The protocol of peripheral short cannula insertion Devices to be prepared:

- Appropriate sized peripheral cannula
- Bandages for fixing
- Skin disinfectant solution
- Sterile cleaning balls
- Disposable non-sterile rubber gloves
- Strangulator
- 2–5 ml physiological saline in syringe
- Cap or three-way stopcock
- Bed protection

Picture 2.: Diagram shows the location of peripheral short cannula

Table 1. The protocol of peripheral short cannula insertion Devices to be prepared

	Intervention	Explanation
1.	Perform hygienic hand disinfection	Due to the observation of the rules of asepsis-antisepsis
2.	Prepare the room (ward, examination room) for performing the operation. ensure adequate room temperature	
3.	Prepare the devices needed for the intervention	
4.	Identify the patient and inform them about the need and process of intervention	This reduces the patient's fears and the patient's cooperation can be enhanced
5.	Perform hygienic hand disinfection and put on the rubber gloves.	Prevention of nosocomial infections and cross contamination, for the protection of health care worker
6.	Place the bed protection under the patient's actual limb, and then attach the torniquetproximally from the intended puncture point.	Make sure that there is no contraindication of puncture on the given limb (e.g. cimino shunt, fracture, local inflammation, etc...)
7.	Determine the vein intended to puncture by the help of your fingers, then disinfect the skin area above it. In cases of patients perspiring heavily, the site of injection and the area of ligature should be shaved otherwise the ligature will not adhere properly.	When the vein is selected, attention should be paid so that it should be placed in a relatively convenient point for the patient, his movement should not affect the penetrability of the cannula, e.g. the insertion of cannula in elbow joint is not a priority, despite the easy accessibility. The primary sites to be selected for the puncture are in the distal part of the arm, cannulation of leg veins should not be routine-like, since in this case, the risk of embolism and thrombophlebitis is higher
8.	Openthe cannula, remove the protective cover from the needle, , and stretch the patient's skin above the planned puncture point	Mainly in the case of elderly patients whose skin are less flexible, and more wrinkled, it is important that this action should be performed so that the catheter can be properly inserted
9.	Insert the cannula, with the needle tip facing upwards, the puncture angle is usually 10–30°	The condition of veins determines the angle of puncture, how deep they are located (the more superficial they are, the sharper angle should be used), and the thickness of the subcutaneous fat layer is defining, as well

10.	Advance the needle until blood appears in the blood collection chamber, this indicates that the end of the needle is in the vein.	In case of a smaller internal diameter cannula, and patients with hypotension, less blood and more slowly flows back to the blood collection chamber
11.	Then, somewhat reduce the angle of insertion, and insert the cannula a few millimetres above	Thus you ensure that the cannula should be in the vein
12.	Slowly pull the needle back from the cannula and watch if blood appears in the length of the cannula	If you see the blood, it means that the cannula is still in the vein, if not, it might have pierced the vein wall, in this case, pull out the catheter with the needle together and start the operation again in another puncture point.
13.	Continue to advance the cannula slowly forward while pull the needle gradually back	It is prohibited to push the needle back into the lumen of the cannula during the operation because the tip of it can tear off a piece of the cannula as well as it might pierce its side. You also must pay attention to the fact that the needle will not be completely removed from the cannula, unless it is led up completely in the vein.
14.	If the cannula is wholly handled, release thetorniquet, and before removing the needle with your fingers press around the end of the cannula	This is to prevent bleeding after withdrawing the needle. Additionally, a gauze may be placed under the cannula proximal end, so when blood leaks it absorbs
15.	After the needle is pulled out the end of the cannula is to be connected to the infusion set, or insert a cap or three-way valve. After that release your finger	When three-way tap directly connected to the catheter, it must be previously saline
16.	If you do not connect infusion to the end of the cannula then flush it out with 5ml physiological saline via a syringe	In accordance with the institutional protocol heparin (or vitamin C) canbe included within the flush. This process ensures the cannula patency. It is important to use so much liquid that it should flush the cannula entirely. While flushing out the cannula observe the skin above it, if a swelling develops, or if the patient indicates pain, stinging sensation. If there are indications that the cannula is not in the vein, then remove it.
17.	If the cannula is in the right place, secure it with a special bandage developed for peripheral cannulae. Make sure that the whole location of puncture should be covered entirely.	In order to prevent nosocomial infections. The optimal decision is when transparent dressing is used because the direct location of puncture and its surroundings can be seen.
18.	Clean up in the patient's environment	Clean up in the ward / examination room in accordance with the rules of hazardous waste, waste management/storage, shedding
19.	Treat the resulting waste selectively	
20.	Perform hygienic hand disinfection	
21.	Document the intervention	It is important to indicate the exact date because of the 72-hour replacement of cannulae and the exact location of the puncture and the cannula size, as well.

Midline catheter

The Hungarian name of the midline catheters in the absence of widespread use is currently unknown, but the authors of this chapter consider it important that each of the technologies / tools – including midline catheters – possibly get their Hungarian name. The authors decided on the use of the name of "középutas katéter" (midline catheter, given the fact that the description does not only reflect that the midline catheter is longer than the short peripheral catheter, and shorter than the PICC (peripherally led up central venous catheter), but - in close connection with it – a device that is an intermediate solution between the previously applied central and peripheral cannulae.

Central vein access

Central vein

Common features of the central veins are:

- High-lumen, dilated veins
- Provide a higher flow rate than the peripheral veins: via the system of the vena cava (superior and inferior) the entire cardiac output flows

Indications of central venous cannulation

- Monitoring central venous pressure
- Pulmonary artery catheterization (wedge pressure measurement)

- Long-term intravenous medication (such as antibiotic therapy)
- Need of long-term parenteral nutrition
- Severe hypovolaemia
- Injection of medication causing phlebitis via peripheral vein
- Dialysis / Plasmapheresis
- For leading up external pacemaker
- The need for frequent or prolonged intravenous route is anticipated
- It is not possible to secureperipheral venous route

Contraindications of central venous catheterization

- Inflamed, damaged skin
- Burnt skin
- Tricuspid valve vegetation
- Diagnosed venous thrombosis on a given section of the vessel / obstruction

The relative contraindications of catheterization the central vein

- Any bleeding disorder, thrombocytopenia (if vein insurance is still conducted, then the location of v.femoralis and v.jugularis externa is preferred in the first place, then v.jugularis interna, because the potential bleeding may be better controlled), anticoagulant therapy
- High-pressure breathing/ventilation
- Carotid artery stenosis with the planned location of catheter
- Sepsis
- Anatomical characteristics and differences

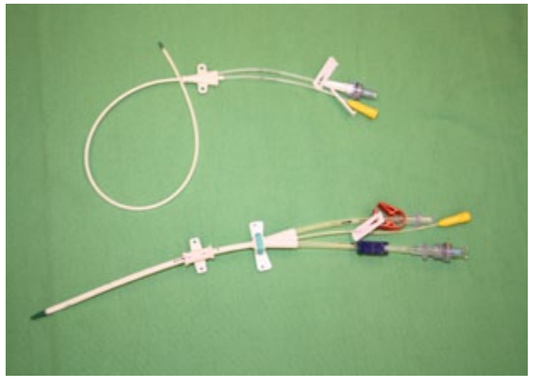
Complications of central venous access

Early complications:

- Arrhythmia
- Injuries of other formulas depending on the location of puncture
- Vein perforation, cardiac tamponade, ventricular perforation
- Bleeding
- Chylothorax (chyle in the chest)
- Nerve damage
- Catheter-related foreign body embolization

Late complications:

- Central venous catheter-related bloodstream infections (CRBSI – intravascular catheter-related blood stream infection
- Thrombus.
- Pulmonary embolism.
- Air embolism
- Myocardium perforation (or subsequent cardiac tamponade)
- Vein occlusion
- (thrombo)phlebitis
- Circulatoryoverload



Picture 3. Multi-lumen central venous catheters

Methods of catheter delivery

- Tunnelled central venous catheters
- Percutaneous central venous catheter /non-tunnelled central venous catheter (Percutaneous Non-Tunnelled Central Venous Catheter)
- Implanted port
- Peripherally Inserted Central (venous) Catheter (PICC)

During the central vein access aseptic conditions are required (sterile sheath, sterile gloves, sterile isolation cloth at the injection site (CDC, 2002; EPIC, 2001). After the central vein access, it has to be confirmed by x-ray that the end of the catheter is in the right place. In case of central venous catheters, if the tip of the catheter is outside the vena cava, then the catheter is no longer considered central venous catheter and the prescribed treatment cannot be continued, so the catheter is to be removed (INS, 2000). The removal of central catheter may be necessary if the catheter is not functioning properly, not penetrable, or signs of catheter-related infection can be observed, such as increased body temperature, or redness, swelling can be observed at the site of introduction by the health care worker. The PICC and non -tunnelled catheters can be removed by a nurse, the removal of the ports and tunnelled catheters requires medical competence, as local anaesthesia and performing incision are necessary to remove it, but it can be solved ambulatory. After the procedure the patient should be advised to protect it from external impacts, and water until the wound has healed.

Intravenous catheter care

Change of bandage in case of short peripheral cannulae, midline and PICC catheters.

The change of dressing must be carried out depending on the dressing materials used, which means that gauze-based dressings have to be replaced every 24 hours at the maximum, and if

they become soiled or wet. Transparent dressings in case of short cannulae may be applied for a maximum of 72 hours, i.e. the removal of them will have to be done together with the change of the catheter. In case of ICC and Midline catheters transparent dressings have to be changed every 7 days, unlessthey are dirty/ contaminated, then they should be removed immediately.

Flushing out of cannulae

The midline and PICC catheters have to be flushed out with minimum 10-ml syringe, since it must be taken into consideration that the cannula has a longer size. After all medication they should be flushed out with saline infusion (based on institutional- and manufacturer's recommendations with added NaHeparin), and if the catheter is not used, heparin flushing out is to be applied twice daily, every 8-12 hours. What must be considered in case of all types of cannulae is that the amount of the flushing /cleaning fluid should be more than the capacity of the cannula.

Care of central venous cannulae

The care of central venous cannulae is a multiple task and is a priority concerning the prevention of nosocomial infections. On the one hand, the health care worker has to ensure patency of the cannula, which can be achieved by regular flushingof the cannula or Heparin closure. On the other hand, the daily routine should involve the check of the site of the puncture and the cannula, as well as the change of dressingshould be in accordance with the recommendations. In addition to the above-mentioned, it is crucial to disinfect the end of cannulae and valve before use so that nosocomial infections can be prevented.

Change of dressing:

Ambulatory patients (e.g. long-term haemodialysis) can have a shower or a bath 7–10 days after the implantation of the catheter but there should always be a dressing covering the catheter and it should not be directly exposed to water. The international recommendations are united in the sense that the dressing of the central venous cannulae must be changed in case of transparent dressings every 7 days, when simple sterile gauze is used at least every 48 hours, and in all cases when the dressing is contaminated, got wet or loose. The right kind of dressing must be chosen depending on the health care worker's decision and the patient's current status.

Absorbent and gauze dressings for oozing, exuding puncture sites, in other cases the transparent dressings are recommended, as using them the location of the catheter can be monitored constantly, so the signs of inflammation can be noticed in time. Nowadays impregnated bandages for dressing the specifically central venous catheter are available on the market, although their efficacy compared to the former has not yet been demonstrated in clinical trials

Blood sampling from central venous cannulae:

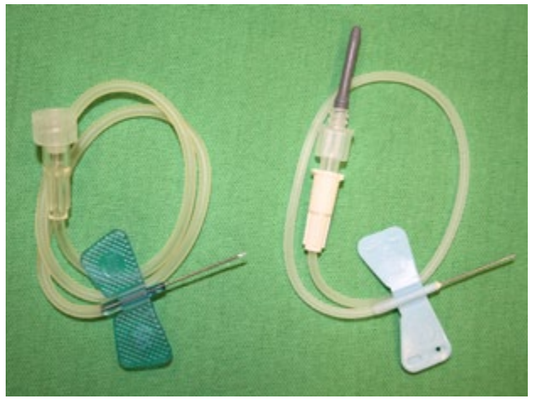
Blood sample collected from peripheral vein– not from cannula- by venepuncture is primarily used for the assessment of the patients' blood chemistry parameters. However, in certain situations such as when collecting a blood sample from peripheral veins is not possible, central venous catheter may also be used. However, some important rules must be followed to ensure that the sampling is successful, and related complications can be prevented, such as blood stream infection caused by catheters or occlusion of catheter.

Needles for Infusion Therapy

To implement infusion therapy via a punctured vein, you can have access via a peripheral or central cannula, or occasionally winged needles (see chapter injection) may be used.

Winged needle

It is a short needle with wings applied on both sides, to which a 70 to 30 cm long flexible tube is connected. Nurses like to choose it, because the wings are sturdy, offer a good grip during puncture, and facilitate easy fitting/mounting of the needle to the skin, while the tube facilitates the implementation of interventions. There is a Luer Lock connector, to which syringes, infusion sets, in case of the type used for blood collection the bell of the closed blood collection system and the sampling tubes, hemocultural bottles can be connected.



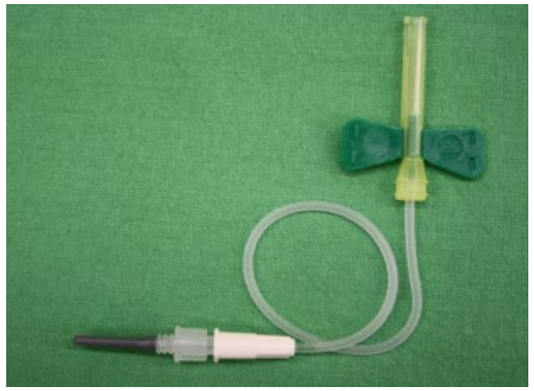
Picture 4. Winged needles used for infusion therapy and blood collection

Winged needle with active safety system

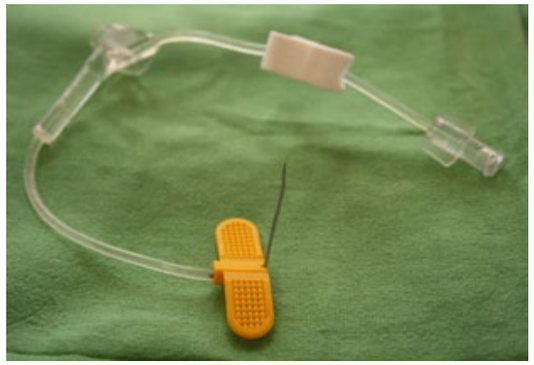
In case of winged needles active safety systems are also involved which serve to prevent needle stick accidents. A plastic protective component has to be slid or snapped over the needle after the puncture or the completion of the therapy in case of active systems. The right fixation is indicated by a clicking sound in this case, too.

Huber needle

The generally right-angled needle is designed to be able to be introduced easily and safely into the port and facilitate the long-term fluid therapy (e.g. chemotherapy, antibiotic therapy, parenteral nutrition). The tip of the Huber needle is very sharp; its use increases the risk of needle stick accidents and yet the venous port is often used in cases of serious, infectious diseases (including AIDS). The characteristic feature of "non-coring" Huber needles is that after piercing it through the membrane of the port, it does not damage it, while the traditional hypodermal needles can cause holes on it.



Picture 5. Winged needle with active safety system



Picture 6. Huber needle

Huber needle with safety system

Several types of Huber needles are on the market and the same can be said about the product range of Huber needles with security system, as well. It is important that the system can be activated with one hand, while with the other the port can be stabilized.

Other factors affecting the vein access:

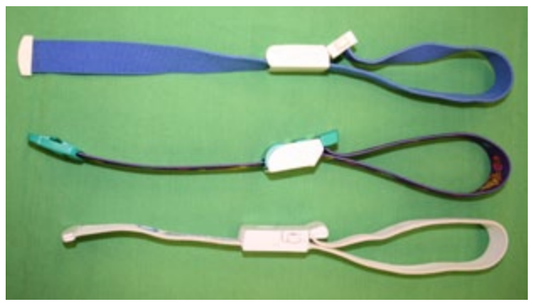
The success of vein access is affected by several pathophysiological factors, connected with the state of the vein walls. Mainly in elderly patients rigid veins, scarring in the vein wall due to repeated puncture is to be expected. Additionally, the injection of various medicinal products into the peripheral vein can have similar consequences, but thrombophlebitis should also be mentioned. Such products are products of chemotherapy, high-osmotic or high potassium solutions. As a result, the rupture of the vein wall is to be considerededuring vein access.

(Rubber) tourniquets

Torniquet/ Strangulator is, in fact, a flexible rubber band, which blocks the blood flow when it is placed in the proximal direction on the given limb. It is used during any intervention, in which the puncture of the peripheral vein is implemented, so in case of blood sampling, during vein access. In addition, it is used when external bleeding occur on the limbs and in case of traumatic amputations.

Reusable tourniquets with fasteners: strangulators of this type are suitable for repeated use, a buckle can be found on them, which ensures immobility. By pressing the buckle, it is possible to release the squeeze immediately as well as to loosen the grip. It is a big advantage that all this can be done with one hand. The disadvantage is that the chance of cross-infections is big, so proper disinfection is essential, but it is often a problem concerning the operating system of the ward, since not each patient can get a strangulator of his own.

Research has shown that many types of fungi and bacterial strains can be detected on the reusable tourniquets so the disposable tourniquets arepreferrable. Disposable tourniquets: now it is possible to use disposable strangulators to reduce the risk of cross-infection, and there are some types impregnated with antibacterial agents (e.g. priority groups by "NHS Saving Lives" - to reduce the spread of MRSA). On disposable tourniquets a buckle cannot be found, the health care worker must tie it, fix it manually, they are Latex-free and have a cover so that they do not slip on the patient's skin, and you can pull them vigorously.



Picture 7. Tourniguets

Infusion therapy

Indication of infusion therapy

- The need of fluid replacement /dehydration or medications
- Total parenteral nutrition (TPN)
- Need of maintaining the vein
- Arrangement of ion balance

The complications of infusion therapy

- Phlebitis
- Fluidextravasations
- Excessive fluid infiltration into the surrounding tissues
- Haematoma
- Air embolism
- Thrombosis
- Circulatory overload
- Infection, sepsis
- Allergic reaction

During the infusion therapy it is essential to observe the patient continuously, to monitor salt-water balance, fluid balance and vital signs, the changes of which may require amendment in therapy. When body temperature is elevated, increased fluid and electrolyte loss should be calculated so the amount and composition of fluid taken in should be determined accordingly. The rise in serum sodium levels can also cause imbalances in the water balance, more fluid intake may be necessary. The increase in heart rate may indicate a lack of fluid, while slowed heart rate can be observed when the level of magnesium and potassium is elevated. Areduced level of the latter can induce irregular heart rate.

The monitoring of fluid balance:

Hypervolaemia is when the body's fluid balance shows a strong positive value, whilst hypovolaemia isthe opposite. Many factors affect the fluid balance, which facilitate either the increased production of urine, or the formation of surplus. The fluid balance assessment is based on the determination of several parameters that are made up of the nurse's observations, taking medical history and the results of laboratory tests and instrumental examinations.

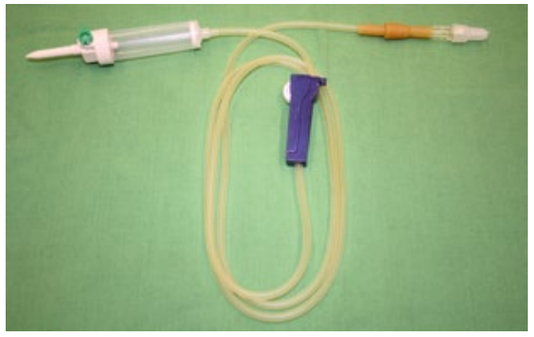
The calculation of fluid balance in millilitres is usually done every 24 hours. It means that the amount of fluidemptied in 24 hours is subtracted from the amount of 24-hour fluid intake. This requires the precise documentation of the input and output, and the definition of these according to a single directive. In an optimal case a balanced-state is experienced, a strong negative value is obtained in case of fluid deficit, while a high positive value in case of excess fluid.

Infusion Tubing

There was no breathing window on the old type of infusion tubing so the introduction of an additional, shorter tube was necessary to balance the pressure in the glass infusion bottles, moreover, the longer tubing was also connected through a rubber stopper on the bottle. The infusion speed could be regulated through the roller drip regulator.

Traditional, standard infusion tubing

The infusion tubing of this type consists of a drop chamber, connection tubing, and a roller clamp, at the end a Luer Lock fitting can be found, it is controlled by gravity. The drop chamber of modern tubing filters air bubbles, thus the probability of air embolism is excluded, and in connection with venting the innovation is that as all air is pressed out of the tube and the liquid reaches the port, it is self-locked, so the liquid cannot escape from the tubing until it is connected to the venous cannula or the needle. The breathing window located on top of the drop chamber serves to equalizepressure .



Picture 8. Traditional, standard infusion tubing

Transfusion tubing

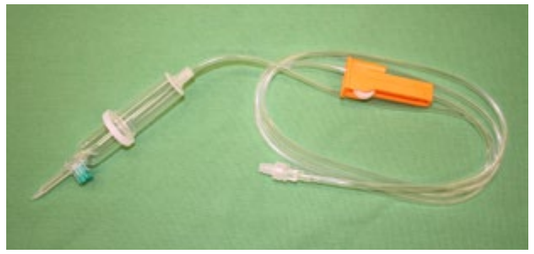
Transfusion sets are very similar to traditional infusion sets. The only difference is that the drop chamber is bigger and there is a filter in it to filter potential clots. The transfusion rate can be controlled by a roller clamp. There are some sets on which the breathing window can be found, but they are also available without it. Some special sets are supplied with

Picture 9. Transfusion tubing

a double filter, or it may be different if they are placed at the upper or lower part of the drop chamber.

Infusion tubing to volumetric pumps

A converter ring, which allows the sets to be fitted to the infusomat, can be found on the drop chamber of the sets used for volumetric pumps. Moreover, a section made of some softer material can also be found on the tubing line proximally, otherwise it is the same as the traditional set. When you use the same venting is necessary, then the infusion will flow in an amount set on the infusomat.



Picture 10. Infusion set to volumetric pumps

Infusion set applied with dosimeters

Usually they are used in relation to child care, but not exclusively. Gravity-controlled infusion set, its characteristic is that instead of the conventional drop chamber, a larger (150 ml) chamber can be found on the set, and it has two roller clamps, one before the chamber and the other immediately below it, so the amount of the out- and infiltrating fluid of the chamber can be controlled, as well as the administration of smaller quantities (up to 150ml) of intermittent infusion is possible.

Drop rate infusion set (drip rate)

Gravity-controlled infusion set, which differs in appearance from the traditional set as much as a drop regulator can be found on it, on which the hourly administered volume of the solution in ml can be set with great precision.

Micro drop and macro drop sets

If the infusion set does not contain a drop counter and the amount of liquid is not distributed by a volumetric pump, the nurse must calculate what drop number is required at a given time so that the infusion can flow down. Prior to the calculations it has to be taken into account if the drop chamber of the available set is a micro- or a macro chamber. If it is a macro chamber, then 10, 12, 15, 20 drops are 1ml, while if it is a micro chamber 50-60 drops are 1 ml of liquid, it varies depending on the manufacturer. The latter sets are rather used in child care, but the macro drop sets are used for administration of larger amounts of liquid

Infusion dosing devices

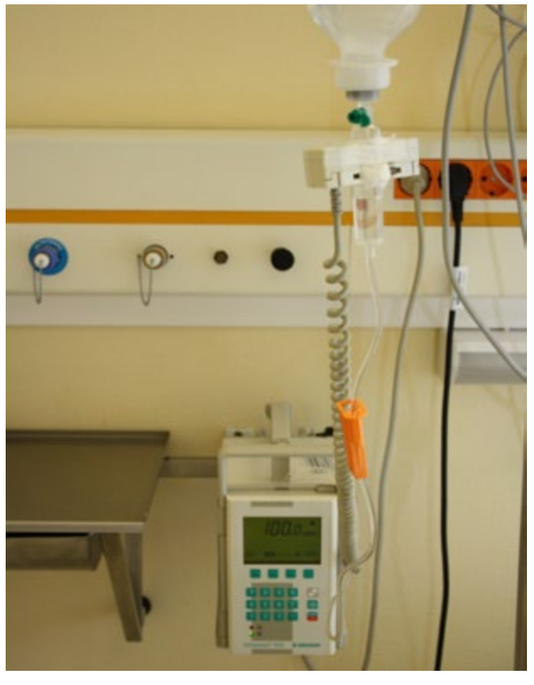
Mechanically controlled infusion dosing sets can be divided into two groups, infusion pumps and syringe infusion pumps. In case of the former, the regulation and control of the infused fluid is based on overflowing method, while in case of the latter, the mechanical drive force of the dosing pumps delivers the dose.

Infusion dosing devices can be peristaltic and piston-driven, the peristaltic driven can operate with a linear or rotary peristaltic mechanism. In infusion pumps operating with linear peristaltic the so-called finger units standing side by side compress the flexible tubing containing the infusion solution in the direction of the flow, which results in transmission of the solution. In the peristaltic pumps the transfer of the infusion solution is promoted by the roller compressing the tube containing the solution. In piston-driven infusion pumps the movement of the piston absorbs and transmits the infusion solution. As a consequence of the operating principle the fluid transport is not continuous, due to the periodic motion the flow of fluid is periodical.

Concerning the control system drop-controlled or volume-driven pumps are distinguished. The accuracy of drop-driven pumps is determined by the drop rate, while that of the volume-driven pump by the volume of the fluid to be administered.

Volumetric Infusion Pump – volume-controlled infusion pump

The differences resulting from the size of the drop can be eliminated by using these devices. They are peristaltic or pis-

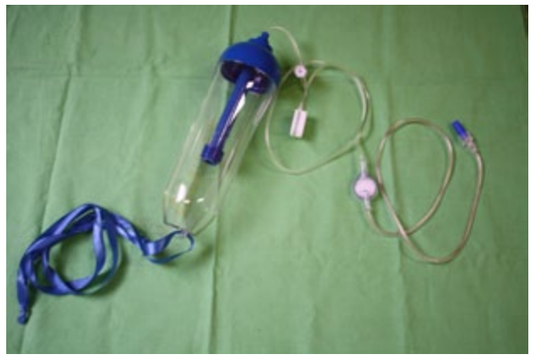


Picture 11. Volumetric infusion pump

ton-driven. The device includes a special attachment, which increases the cost of infusion therapy, however, by using it the flow rate and thus the amount to be administered per unit time becomes very precisely controlled.

Single-use, portable, elastomeric infusion pump

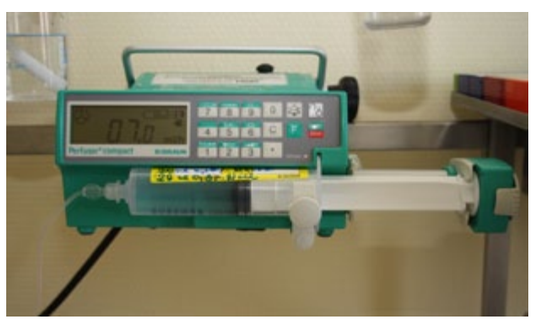
The disposable, portable, elastomeric pumps are infusion pumps which allow continuous pharmacological dosing and can operate without batteries or electricity, usually their 65, 100, 150, 250, 550-ml version is known. In particular, they are applied during chemotherapy, antiviral therapy, pain management and immune suppressed treatment (malignant diseases, chronic pain, childbirth).



Picture 12. Single-use, portable, elastomeric infusion pump

Syringe Infusion Pump

The most frequently used infusion pump is the pressurized infusion pump with a syringe. The size of the syringe to be placed in the device, depending on the manufacturer, can be from 2ml up to 100ml syringes (but usually 20 to 50 ml syringes are used). Such infusion pumps are very accurate and when they are applied a perfusion set which can be connected to the syringe is required.



Picture 13. Syringe Infusion Pump

Patient-controlled analgesia (PCA – Patient Controlled Analgesia)

Small-sized infusion pump operating with a battery, controlled electronically. The infusion pump allows continuous pharmacological dosing, thus ensuring the basic medication level. In addition, the patient can increase the amount of the administered drugs according to his individual sensitivity. The drug dosage is programmed by a doctor (or by the nurse according to doctor's instructions) and the patient – in order to prevent the excessive use – within certain restrictions can dose the drug according to his own needs.

Infusion Therapy Accessories

Extension and connection tubing

From among the extension and connection tubing with different length the nurse should select the most suitable one. It is recommended to apply the device facilitating the mobilization of the patient as soon as possible (e.g. spiral tubing, which can also help the mobility and feeling of comfort of the patient confined to bed as well as that of the patient who is mobile). The introduction of the infusion solution or active agent into the bloodstream free of contamination is a key factor during infusion therapy as well as during the absorption of drugs. By the help of various cocks and connectors ("T" and "Y" connector) solutions can also be administered without the use of needles, furthermore by their use the concurrent administration of multiple products is also possible. Before use, the cocks must be vented in any direction, and the tubing should be disinfected prior to manipulations. The medication and lipid resistant cones facilitate safer patient care. When using the cones, it is important to be aware of the colours, the blue cones for intravenous devices, while the red ones are used for cannulae in the artery. By using needle-free valves introduction of fluid is available without using a needle such as the introduction of drug through intravascular catheter, furthermore the incidence of needle stick accidents and air embolism can also be reduced.

The protocol of the compilation of infusion

The devices necessary for the intervention:

- Non-sterile disposable gloves
- Infusion solution
- Infusion tubing
- Disinfectant
- Kidney dish

Table 2. Infúzió beadása

	Intervention	Explanation
1.	Perform hygienic hand disinfection	Due to the rules of asespsis-antisepsis
2.	Prepare the room (ward, examination room) to perform this operation. Provide adequate room temperature.	
3.	Get the devices needed for the intervention ready	
4.	Identify the patient and inform them about the need for intervention and the process of interference	This can reduce the patient's fears and his co-operation can be enhanced
5.	Make sure on the basis of documentation that the prescribed solution has been made ready	
6.	Perform hygienic hand disinfection and put on rubber gloves	To prevent nosocomial infections and the transmission of cross-infection.
7.	Remove the outer protective cover of the bag, and then examine the macroscopic solution.	To ensure safe medication
8.	Label the infusion solution (patient's name, number of ward, date, your name)	
9.	Place the solution on the infusion stand	
10.	Remove the protective cover of rubber stopper with your dominant hand, fix the bottle or bag with the other hand. Then, disinfect the rubber stopper and wait respecting the time of exposure.	
11.	Expand the infusion line, close the roller clamp.	
12.	Pierce the spike of the set through the stopper firmly	
13.	Open the aeration hole of the drip chamber, then compress the plastic drip chamber with your index finger and thumb.	The drip chamber can be filled up by this movement, fill it up to about half of it, so the infusion flow can be observed well.
14.	Vent the line into a kidney dish releasing the roller clamp for drop controller entirely	In order to prevent air embolism
15.	If other pharmaceutical products are to be administered into the infusion solution, withdraw the product into the syringe as described in the section Pharmaceutical applications. Remove the protective cover of the other line of the infusion and disinfect the rubber stopper. After the end of the exposure time, enter the solution into the infusion by means of a needle. Describe on the infusion label what other product the solution contains.	Other products can be added to the infusion solution when compiling a new injection as well as during infusion therapy which has already begun, but the process is not different in the two cases.
16.	When an infusion set equipped with a dosimeter is used, close both roller clamps before inserting the spear. In order to fill the chamber, open the top clamp, so you can fill it with enough amount of solution, and then close it. Vent the tubing, the bottom clamp has to be opened for this. If medication must be injected into the chamber, so after withdrawing it into the syringe by means of a needle after the disinfection of the port you can do it. Then you can fill up the chamber with sufficient amount of infusion solution by opening the upper clamp. The actual number of drops can be adjusted by the lower clamp.	
17.	Clean up in the room respecting the rules of hazardous waste, waste storage, shedding.	
18.	Perform hygienic hand disinfection.	To prevent nosocomial infections and the transmission of cross-infection.

The protocol of the administration of infusion

The intervention will need:

- Non-sterile disposable gloves
- Infusion solution with vented/ air free tubing
- Infusion stand
- Disinfectant
- Gauze
- Syringe of physiological saline (or maybe with heparin)

Table 3. Infúzió bekötése

	Intervention	Explanation
1.	Perform hygienic hand disinfection	In compliance with the rules of asepsis, antisepsis.
2.	Prepare the room (ward, examination room) in order to perform this operation. Provide adequate room temperature.	
3.	Get the devices needed for the intervention ready	
4.	Identify the patient and inform them about the need for intervention and the process of interference, then take their blood pressure.	This can reduce the patient's fears and his co-operation can be enhanced
5.	Calculate the proper number of drops, consider the type of infusion set and the time needed for the infusion.	
6.	Make sure that there is an infusion stand at the patient's bedside, and if he has some intravenous cannulae in (if not, access the interconnecting vein as the protocol previously described requires).	
7.	Perform hygienic hand disinfection, and then put on rubber gloves	To prevent nosocomial infections and the transmission of cross-infection.
8.	Check the label on the infusion solution if the appropriate product is administered to the right patient	In order to provide safe medication.
9.	At the patient's bedside, even before the injection, check the infusion solution macroscopically, and make sure the bottle / bag is not damaged.	
10.	Hang the infusion solution to the stand. Make sure that the tubing is vented.	
11.	Disinfect the injection port of the cannula port respecting the time of exposure	To prevent nosocomial infections and the transmission of cross-infection.
12.	Place a gauze under the closing cap of the peripheral cannula, remove the cap and then connect the infusion set to the end of the catheter with quick movements, then open the roller clamp.	When the tubing is connected to a three-way cock, disinfect the given line of the cone, connect the tubing, and then open the stopcock toward the patient's direction. When valves are used, screw the tubing, and release the compression on the line of the cannula. If the infusion is not flowing, wash the line of the cannula with saline (possibly heparin solution).
13.	Set the correct number of drops by means of the roller clamp, or the drop control unit of the infusion tubing with a drip.	
14.	Put order in the room in compliance with the rules of hazardous waste, waste storage, shedding.	
15.	Clean up in the patient's environment	Clean the ward/ examination room in compliance with the rules of hazardous waste, waste storage, shedding.
16.	Selectively treat the resulting waste	
17.	Perform hygienic hand disinfection	
18.	Monitor the patient during the infusion several times, inquire about the potential infusion therapy-related complications	
19.	Document the operation	

The protocol of the removal of the infusion tubing

The intervention will need:

- Non-sterile disposable gloves
- Disinfectant
- Gauze
- Syringe with physiological saline solution (heparinised possibly)
- Closing cap

Table 4. Infúziós szerelék eltávolítása

	Intervention	Explanation
1.	Perform hygienic hand disinfection	In compliance with the rules of asepsis-antisepsis
2.	Prepare the room (ward, examination room) in order to perform the operation. Provide adequate room temperature.	
3.	Get the devices needed for the intervention ready	
4.	Identify the patient	
5.	Perform hygienic hand disinfection, then put on rubber gloves.	In order to prevent nosocomial infections and the transmission of cross-infection.
6.	Make sure that the prescribed amount of infusion solution was administered. Close the roller clamp.	
7.	Disinfect the end of the cannula in compliance with the time of exposure	In order to prevent nosocomial infections and the transmission of cross-infection.
8.	Place the gauze by the end of the cannula, then unscrew the infusion line. Right after it connect the syringe with pre-filled physiological saline to the cannula and wash it with it. At the end of the process, place the closing cap at the end of the cannula.	You can prevent the backflow of blood if the skin area over the cannula is compressed by your fingers. When using a three-way tap, close it, unscrew the tubing and connect the pre-filled syringe, open the cone again, inject the solution, and then close the cone again. At the end of the process place the closing cap on it. If a valve is used, compress the line and then unscrew the tubing and connect the pre-filled syringe. Then again, release the line, rinse it, compress the line of the cannula strictly before removing the syringe. At the end of the process place the closing cap.
9.	Clean up in the patient's environment.	Clean up the ward /the examination room in compliance with the rules of hazardous waste, waste storage, shedding
10.	Treat the resulting waste selectively.	
11.	Perform hygienic hand disinfection	
12.	Document the operation	

The infusion / transfusion variations

Pressurised infusion / transfusion

In general, it can be used in case of severe loss of fluids, traumatic conditions. In this case the plastic infusion bag should be placed in the pressure bag and the cuff is placed under the proper pressure by inflating the cuff, and therefore the fluid is delivered to the patient at high pressure, in bolus. The administration of pressurized infusion / transfusion requires greater attention paid to the vital parameters, and signs of circulatory overload.

Warmed/ heated infusion / transfusion

In some cases it may be necessary to administer warmed infusion solutions (e.g. for hypothermic patients). When the most commonly used heating technology is implemented, the infusion set should be placed around the relevant part of the heating apparatus, and through it in a direct contact, the solution in the tubing picks up the temperature which has been set on the device operated electrically. The temperature can be controlled precisely and reaches the desired temperature quickly, in approx. two minutes. The heating device displays the temperature of the solution so the supplier can monitor it continuously, and it is excluded to deliver preparation of inadequate temperature due to the function of the special alarm.

Piggy Back

When applying Piggy Back a secondary infusion set is used for the delivery of intermittent infusion. The piggy back has a special tubing and so does the primary infusion, the latter must be a Y-branch set. In general, it is used (together) with the co-application of an infusion pump, which is used to control the volume, but they are not used exclusively together.

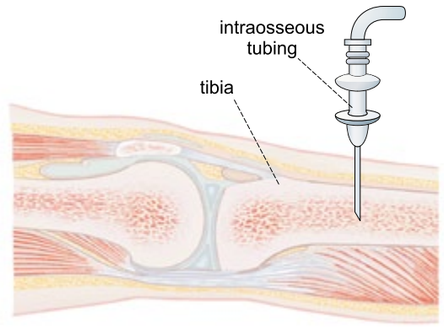
The specific forms of infusion therapy

Subcutaneous Infusion (Hypodermoclysis)

As an alternative of vascular access the intermittent and permanent delivery of isotonic infusion solution and some drugs (e.g. opiates) into the subcutaneous tissue (outer part of the upper arm, chest wall, supraclavicular area, upper part of the back, abdomen, thighs etc), can be implemented (INS, 2000). Hypodermoclysis infusion therapy should be considered in the short term to restore and maintain hydration with mild or moderate risk for dehydration or dehydration. It is a widely used procedure, especially in the care of elderly and in palliative therapy, it can be implemented safely even in home care.

Intraosseous infusion

Certain benefits (such as the possibility of puncture in hypovolaemia, high-volume fluid intake facility) of central vein access can be utilized by a needle inserted into the marrow space by a special device. Since the devices (BIG, Ez-Io) which can be used faster, more easily, and in a less traumatic way



Picture 14. The essence of the operation of intraosseous infusion

both psychologically and physically for the patient and the supplier have been put into circulation, the application of intraosseous technique has increased.

The complications of intraosseous venous access:

Most complications can be eliminated in compliance with the rules of asepsis-antisepsis during the placement and administration, and it also should be known that the development of complications related to intraosseous venous access is much faster than the complications developed during the peripheral short cannulae, or central venous catheters.

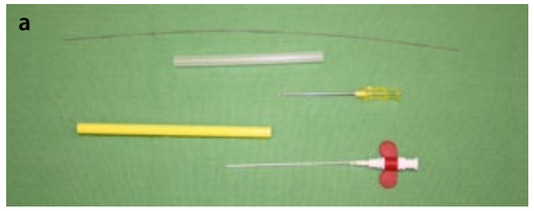
Arterial cannula

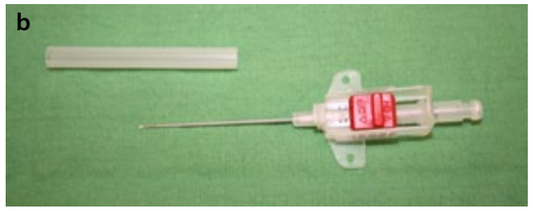
Radial artery (a. radial), femoral artery (a.femoral), axilliary artery (a. axillary), brachial artery (a. brachial), ulnar artery (a. ulnar), dorsal pendis artery (a. dorsalis pedis), posterior tibial arteries (a. tibialis posterior), or temporal artery (a. temporal) can serve as the site of the puncture. The most common puncture site is the radial artery in case of both adult and paediatric patients because it is easy to access, the artery is located close to skin surface, the patient is less disturbed by the cannula led up, it is easier for care providers to carry out everyday care tasks and the complication incidence is rare. Brachial artery (a. brachial) as a puncture point is not used in case of children. Local anaesthesia is usually used when it is inserted. There are several kinds of arterial cannulae. There are some types which are similar to the short peripheral venous cannulae ('catheter over the needle) in appearance and in insertion technique and there can be cannulae with a longer line/neck, for their delivery Seldinger technique is used. The former ones are used mostly in case of infants, young children while the latter ones in case of adults, for arteries with larger diameter.

Nursing tasks in case of arterial cannulae

Change of bandage

Gauze – based dressings daily, transparent dressings every 7 days must be changed if necessary.





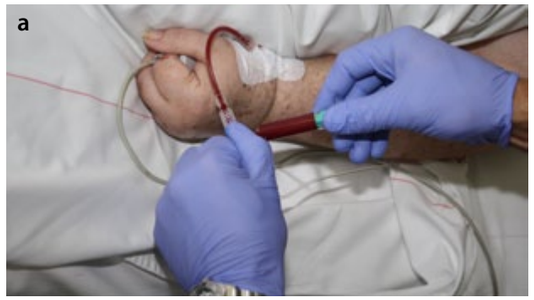
Picture 15. a: Arterial catheter which can be delivered by Seldinger technique
b, c: "the catheter over the needle"

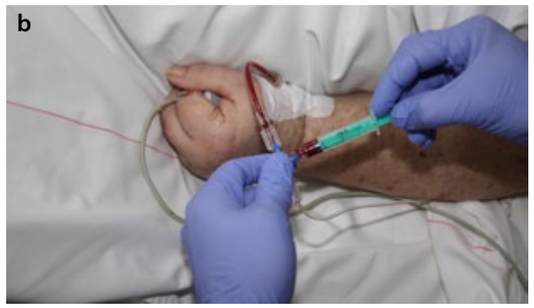
Flushing out of cannulae

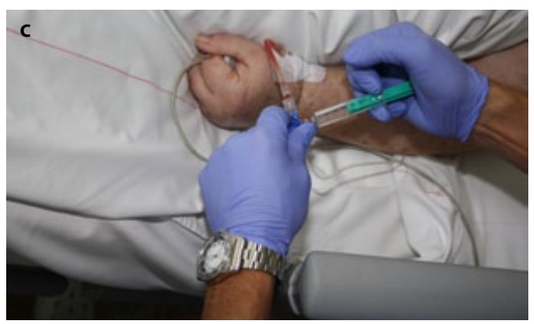
In case of arterial cannulae it has been shown that flushing out with heparin played an important role in the increase of the duration of patency and in the reduction of the formation of blood clots as opposed to "merely" flushing out with physiological saline.

Blood collection from arterial cannula

Blood collection from arterial cannula is most often necessary for the determination of blood gas parameters. A red three-way cone is connected to the cannula in every case and blood is drawn through it. First, close the cone so that the blood can circulate between the catheter and one of the free







Picture 16. a, b, c, d. Collection of blood samples from artery cannula
Invasive arterial blood pressure measurement is described in the subchapter of blood pressure measurement

lines of the cone. Before connecting the syringe to the free line, it should be disinfected, and 3-5 ml of blood should be withdrawn in order to eliminate the flushing fluid and heparin in the catheter. Then, the amount of blood necessary for the blood gas test has to be drawn into a 2 ml heparinised syringe. Too much heparin can affect the resulting parameters (e.g. lower CO2 and bicarbonate measurements), so the total amount of heparin in the syringe should not exceed 5% of the sample. Usually the amount of 2 ml of blood is drawn, so in this case, the amount of heparin is less than 0.1 ml. Care should be taken that the cone should be closed when the syringes are changed and after blood collection the catheter must be flushed out again to avoid clots.

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22. The General Aspects of Transfusion

BY PH.D. ANDRÁS OLÁH, NIKOLETT GÁL, RÓZSA FEHÉR, FERENCNÉ ZBOROVJÁN, KATALIN FUSZ

The concept of transfusion

Blood transfusion (transfusion) is tissue transplantation, aimed at the curative or preventive introduction of blood products (red blood cells (RBC), platelets (thr.), white blood cells (WBC), plasma) into the recipient's vascular system.

The aim is to supply the elements of blood missing from the patient's body or having lost their function. These may be cellular (RBC, WBC, platelet) or plasma (albumin, globulin, clotting factors). Life-threatening anaemia, blood loss caused by circulatory failure, severe oxygenation impairment are absolute indications. The necessity of red blood cell transfusion cannot be exclusively linked to the patient's number of haemoglobin or haematocrit. In order for Blood Transfusion to be considered,the clinical signs of anaemia, the patient's general condition, tissue oxygenation, the underlying disease, and blood loss are to be assessed together. There is no general rule but if the haemoglobin is below 60 g/ l transfusion is almost always indicated, if it is over 100g/ l, you should rarely need red blood cell transfusion.

Transfusion-related responsibilities

According to the current Hungarian legislation transfusion can be carried out only by physicians having taken the training course of blood transfusion, having the license of the department manager authorized in writing, as well as by professional staff, meeting the above mentioned conditions. According to legislation, which became enforceable in 2010, 15/2010 (IV. 9.) a nurse who has completed 60 hours of training on Transfusion Therapy, has also acquired the transfusion certified license exam, and who has written permission from their departmental head, can perform blood transfusion. Under this Regulation, where training has occurred previously and been accredited by OVSZ, it also became necessary for the specialist workers (this includes, NTR write abbreviaiton in full -care skills, nursing initial qualification, based on 5.4. at a health profession within the group qualifications, nursing, graduate nurses who hold a Batchelor of Science in Nursing and the NQR before the nurse training), to perform the licensing examination and to obtain the license exam for intravenous medication and infusion therapy (or certificate entitling the previous infusion therapy).

In October 2010, this regulation was revoked, and the knowledge necessary to perform these activities has been incorporated into current health professions training programmes The Head of the Department should ensure that doctors and health workers participate in regular further training. In all health care facilities a transfusion medical doctor should be appointed and this duty can only be performed by the physician who has completed the transfusion course registered by OVSZ within five years and who is involved in the training courses required by OVSZ.

The responsibility related to transfusion therapy is shared by the people doing these jobs in a specific institution and includes the following personell: a hospital manager, a physician responsible for medical transfusion in the institute, the head physician in the department, the physician responsible for transfusion in the department, the physician setting up the indication of transfusion, the person who performs blood transfusion, people performing other assisting activities and Medical Transfusion Committee. The nursing tasks related to transfusion therapy appear directly in relation with the doctor setting up the medical indication for transfusion, the performer of the transfusions and other assisting health care workers primarily, so responsibilities related to these positions are considered below.

Transfusion can only be requested by a physician, their duty is to determine all the parameters of the transfusion (blood type and product type, compatibility requirements of non-elected, elected; quantity, the way of administration, and its speed of infusion). The name of the doctor must be indicated in the patient's documentation, on the transfusion report card, transfusion page, serological log, and blood bank logs, as well.

The performer of the transfusion is the person who

- checks the patient's identity
- informs the patient of the progress and possible complications of the procedure
- takes blood samples and transfers them to the laboratory for blood-grouping
- performs the required tests at the bedside
- examines and identifies the blood product microscopically prior to the administration
- connects the transfusion tubing
- administers blood products
- observes the patient
- performs the required administrative tasks

If these tasks are shared between several people, the responsibility is also shared. If the person who requires the transfu-

sion and the one who performs it is a different person, then the latter is solely responsible for the correctness of carrying out blood transfusion. The documentation of the procedure must indicate who carried out the various phases of work. The responsibility of people involved in other supporting activities (i.e. receiving blood products, transportation, storage etc) of transfusion therapy must also be determined and these people must be given the necessary training for performing these duties.

Legal aspects of transfusion

In Hungary Regulation 3/2005. (II. 10) of the Ministry of Health contains the quality and safety standards related to human blood and blood component collection, testing, processing, storage and distribution and the requirements of each of these related to their technical requirements. In Hungary the National Blood Transfusion Service Centre –with the approval of the Special College of Transfusiology and Haematology, and the Ministry of Health issued the methodological letter of the Regulations of Transfusion in 2008. This letter was authorized by the government regulation of 323/2006 (XII. 23) No. 5 of the decree § (2) e) and replaced the methodological letter of the Transfusion Act Rules of 1998 issued in accordance with the regulation 48/1995. XII. 29th Decree of the Minister of Welfare. The personal conditions are controlled by the Transfusion Rules of the National Blood Transfusion Service (OVSZ) as well as by the regulation of 15/2010 (IV. 9.) EüM./Ministry of Health Care.

The ethical aspects of transfusion

The patient's right to their religious beliefs in relation to transfusion must be mentioned in the case of Jehovah's Witnesses, as accepting blood and blood products and medicines containing them is considered to be a sin because of their religious teachings. Further questions are raised by the role of the medical oath in critical condition, when transfusion would be justifiable but the patient refuses it because of their religious beliefs.

Haemovigilance

Haemovigilance is *a registration, monitoring system,* which includes the entire transfusion process from blood collection to producing blood products. It keeps track of the blood transfusion process from donor to recipient, of serious or unexpected events, and of the serious adverse reactions/complications. Furthermore, it is its duty to follow the donors epidemiologically.

The United States Food and Drug Administration (Food and Drug Administration – FDA) has initiated the monitoring of adverse drug reactions (Pharmacovigilance) as well as the development of transfusion data collection in 1970. In the 1990's two different reporting systems developed in Europe, one is the French model of compulsory participation, and the other type is voluntary, such as in England. The Serious Hazards of Transfusion (SHOT) was established in the United Kingdom, which is a professionally managed haemovigilance, and it is considered to be "golden rule" of haemovigilance. The European countries have joined these initiatives and the registered and reported events by the clinicians are collected in a different way in each nation compulsorily or according to regulations. They reflect on the reasons why unexpected events have occurred. It can be concluded that a significant proportion of errors are caused by human error (such as pattern changes, non-recognition of human errors in blood sample labelling, which is due, for instance, to the blood transfusion in the night shift, the similarity of the patients' names). Four EU directives were published between 2002-2005, which regulate the information of the donors, the nomination of blood products, the quality system which is to be operated in blood supply and the reporting policy of unexpected incidents related to blood donations and transfusion. Since 2007 they have had to be sent to the European Union (EU), which allows member countries to be compared in this respect.

The history of transfusion

In 1492 transfusion therapy was first known to have been used for the treatment of Pope Innocent VIII who fell into a coma from a stroke. The pope's blood was transfused by three young boys' blood but he died shortly afterwards.

Richard Lower performed the first successful blood transfusion in dogs in 1665, during which animals that had been bled were successfully kept alive. Probably due to published experiments the first human blood transfusion was performed by Jean-Baptiste Denis in July 1667 (published by the Royal Society in September), in which sheep blood was given to a 15- year- old boy without complications. In November1667 a transfusion with a docile animal's blood was carried out by Lower and King in order to change human personality. Lower observed that the patient was in good health condition. Later on due to the further transfusions carried out in this way in England, the patients often died.

The development of blood transfusion had to be waited for until the 19th century. In 1818 James Blundell performed the first successful human blood transfusion in a patient with end-stage bile duct cancer, a procedure which was successfully used several times later in case of severe postpartum haemorrhage. Significant amounts of money were spent on research by him, as well as this, he was the inventor of several instruments that helped transfusion therapy (eg. the impellor, the gravitator). In 1840, Samuel Armstrong Lane aided by him performed the first successful transfusion in haemophilia.

In 1821 Jean Prevost and Jean Louis Dumas have successfully performed blood transfusion in dogs by fibrinogen-free blood inhibited in coagulation (because the fibrin had been removed from blood). Bischoff in 1835, while in 1850 Brown-Sequard suggested the use of defibrillation/defibrination (defibrillate /defibrinate) to eliminate coagulation. During the procedure blood products, which were to be transfused, were produced by whipping or twirling of blood, then by removing the clot. After failed attempts the first successful *defibrillation transfusion* was reported by Sir Thomas Smith in 1873, which was conducted in a neonate. Several attempts were conducted for defibrination. The possibility of anti-coagulation was studied by J. Neudorfer, who in 1860 proposed the sodium bicarbonate, while Braxton Hicks experimented with sodium phosphate.

In 1874–75 Leonard Landois described the post-transfusion haemolysis of red blood cells, which is the phenomenon of dissolution of red blood cells, that had been documented since 1666 and he analyzed 476 blood transfusions since then. In the course of his work he found that the inter-species blood transfusions can cause abnormalities because 62 out of the 129 transfusions from animals to humans proved fatal.

In 1900, Karl Landsteiner discovered the A, B and 0 blood groups (which is the discovery in 1930 he received the Nobel Prize in physiology and medicine for). The fourth blood group (AB) was discovered in 1902 by Alfredo von Castelli and Adriano Sturli. However, it was not until 1907 when Reuben Ottenberg and Schultz proposed AB0 blood grouping of the donor and the recipient and that the donor's and the recipient's blood should be mixed together, that is cross-matched blood, which should be carried out prior to transfusion. D antigen and thus the second most important blood group system (Rh blood group system) in addition to the AB0 blood group were discovered by Karl Landsteiner and Alexander S. Wiener in 1940.

Albert Hustin and L. Agote simultaneously discovered that adding sodium citrate to the blood can prevent blood clotting. L. Agote performed the first human citrated blood transfusion in 1914 which was successful. In the first half of the 20th century blood products were stored in bottles with rubber stoppers, it meant a significant step forward when from 1950 Carl Walter and WP Murphy introduced plastic bags and it became possible to break down the blood collected into components in a closed system.

Solomon and Fahey performed the first therapeutic plasmapheresis, a procedure when only donor plasma is removed and from which other materials can be obtained via further processing (such as immunoglobulins, albumin). Since 1964 this technique can be used to produce factor concentrate and to collect plasma. Since 1961 it is possible to create a platelet concentrate and since 1972 cytapheresis technology is available. During the procedure it is possible to remove the abnormally high number of blood cells in the blood (such as leukemia, thrombocytosis).

Since the mid 20th-century the development of the artificial blood, more specifically the development of artificial oxygen carriers have become a more and more realistic objective. Leland Clark began experiments with fluorinated hydrocarbons in 1960. Then the examinations for the use of animal and human haemoglobin started, as well.

The partial replacement of transfusion therapy was allowed by the discovery of erythropoietin in 1970, which increases the production of red blood cells in bone marrow, and its therapeutic use started from 1996.

The serological – blood group bases of transfusion

Blood Group Systems

Various macromolecules, certain types of which behave like blood group antigens, can be found on the red blood cell membranes. The blood group antigens can be divided into different groups based on their chemical structure. These macromolecules are proteins (e.g. Rh), glycoproteins where either the carbohydrate part (e.g. AB0) or the protein part bears the antigen property (e.g. Duffy, Kidd), or they can be glycolipids that contain different antigenic determinant **groups -** epitopes. According to the current systematization in the human body there are 30 different blood group systems, among which the most important are the AB0 and Rh blood group systems, as well as the clinically significant *Kell-, MNS-, Duffy-, and Kidd-blood group system.*

The test of blood group antigens and antibodies takes place in laboratory conditions via reaction based on agglutination, whereby the antibodies create a bridge to red blood cells carrying the antigens in their membranes.

AB0(H) – BLOOD GROUP SYSTEM

The AB0 blood group system was discovered by Karl Landsteiner, who distinguished A-, B-0 blood groups in 1901, the AB blood group was discovered a few years later. Since the exact structure knowledge of the various antigens, the system should be called AB0 (H) blood group. AB0 (H) blood group system is formed by three different antigens**:** *A, B and H antigens,* which are the red blood cell membrane macromolecules. The H-antigen chemical structure is characterized by the fact that to its lipid part an oligosaccharide chain is connected, which is connected by N-acetylglucosamine preterminally and by D-galactose, which L-fucose joins terminally. The product of H gene is a fucosyltransferase, which connects an L-fucose (monosaccharide) to the D-galactose. The resulting N-acetyl-glucosamine, D-galactose-L-fucose compound with this sequence is the H-antigen. Both the A and B antigens develop from the H antigen. The A-antigen is formed when the product of A gene, a specific transferase, connects an N-acetyl-galactosamine to the-D antigen galactose of the H antigene. The B-antigene is formed when the product of B gene, which is also a transferase connects another D-galactose to the galactose of the H antigen. These antigens can be separated in the gland cells, so they may appear in saliva, tears, sweat and breast milk as well.

Natural antibodies may be formed against A and B antigens, these are the anti-A and anti-B. In the human blood plasma, out of these natural antibodies only the ones can physiologically be present that do not have their appropriate antigen on the red blood cell membrane. Both antibodies belong to the M subclass of antibodies -immunoglobulins. On the red blood cells of people with A blood type A antigen, in their plasma anti-B can be found, while on the red blood cells of people with B blood type B antigen, in their plasma anti-A can be found. On the red blood cells of people with 0 blood type H-antigen can be found, while in their plasma anti-A and anti-B can also be found. On the red blood cells of people with AB-blood type, A-and B antigens are present while in their plasma no antibody can be found. The aforementioned antibodies in newborn babies are created when oligosaccharide antigens originating from plants and bacteria get into their body from their intestinal tract.

Rh blood group system

Landsteiner and Wiener performed immunization in rabbits with the blood of Rhesus macaque monkeys, the immune serum obtained from them agglutinated one part of the human red blood cells. The name of Rh factor goes back to this. This Rh factor, as it later turned out, is made up of several antigens, of which the following five are the most important: D, C, E, c**,** e-antigen. The aforementioned five are all highly immunogenic antigens, but out of them the D antigen is the most significant. The D antigen can be found on the red blood cells of about 85% of the European population, so these people are Rh D-positive blood type, while the ones on the red blood cells of which the aforementioned D antigen cannot be found belong to the Rh D-negative blood type.

While in the case of the AB0(H) -blood group system, natural antibody formation begins in a few-month-old newborn, while antibodies against the D-antigens are only produced when Rh D-negative blood type individual is given Rh D-positive blood, incompatible for the infant, or when Rh D-negative mothers are pregnant with Rh D positive fetus. Maternal immunization can occur during pregnancy, but in most cases childbirth, miscarriage or induced abortion will occur. During the immunization anti-D antibodies are formed against the D- antigens getting into the body of Rh D-negative individuals. The anti-D antibodies belong to the G class of immunoglobulin, which has a specific feature that it crosses the human placenta, so at the next Rh D incompatible pregnancy, the anti-D getting into the fetus damages its red blood cells. The anti D getting into the Rh D positive fetus can cause haemolytic disease in newborns, against which a way of protection is that the known Rh D-negative mother is provided Rh prophylaxis after the birth of Rh D-positive fetus, which means that anti-D immunoglobulins are injected into maternal circulation. The anti-D antibodies injected into mother's body prevent maternal immunization. In the case of Rh D-negative gravida, during the pregnancy, there may be situations in which the anti-D prophylaxis should be performed (Transfusion Policy). Neonatal haemolytic disease can be caused by not only anti-D, but by antibodies of other blood group systems crossing the placenta (e.g. anti-K, anti-c, anti-Jk, anti-Fy antibodies). The disease caused by them is not less serious, but there is no prophylaxis available against it.

Alloimmunization

During transfusion antibodies may be produced against red blood cells, white blood cells, platelet antigens, and plasma proteins. When you use platelet- and white blood cell products, there is a high risk of developing immunization against HLA antigens. As red blood cell alloimmunization can occur in case of white blood cell- and platelet preparations produced from whole blood because of the contamination in red blood cell, in case of reproductive-aged women or sick girls, the RhD-property of the blood preparation and the recipient must always be taken into account. If by mistake or in an emergency Rh D-negative child-bearing aged woman was administered less than 100 ml of Rh D-positive red cell concentrate, 15 ml per 300 µg of anti-D IgG should be given within 72 hours after the blood transfusion to prevent immunization (however, prevention is ineffective if more than 100 ml of Rh D-positive blood product has been administered).

Preparative Transfusiology

Blood donation, the suitability of blood donors

In Hungary, since 1949 donation gradually became free of charge, since 1959 has become fully free and happens in voluntary form with the organization of the National Blood Transfusion Service. The WHO and all other professional organizations (Council of Europe, European Union) support voluntary, free donations, as they contribute to safe transfusion by reducing the incidence of risk factors.

Allogeneic (homologous) blood donation: taking blood or blood components from a person for transfusion performed in another person subsequently, for using them in medical devices or as raw material of pharmaceutical products.

Autologous blood donation and auto transfusion: taking blood or blood component exclusively for using it for auto transfusion in the future (donor and recipient are the same person) or when other therapeutic interventions are carried out for the same person.

When blood sample is collected, **450 ml + 10%** blood is taken, from the whole blood collected, a single unit of red cell concentrate, platelet concentrate and fresh frozen plasma can be produced. Besides the collection of entire blood, a collection of some blood components (platelets, white blood cells, plasma) can take place, this is blood product production via the technique of apheresis. Whole blood donation can take place three times in case of women, while in the case of men four times a year, at least **56 days** should elapse between the two donations (in case of thrombocytapheresys and plasmapheresis donation can take place more frequently).

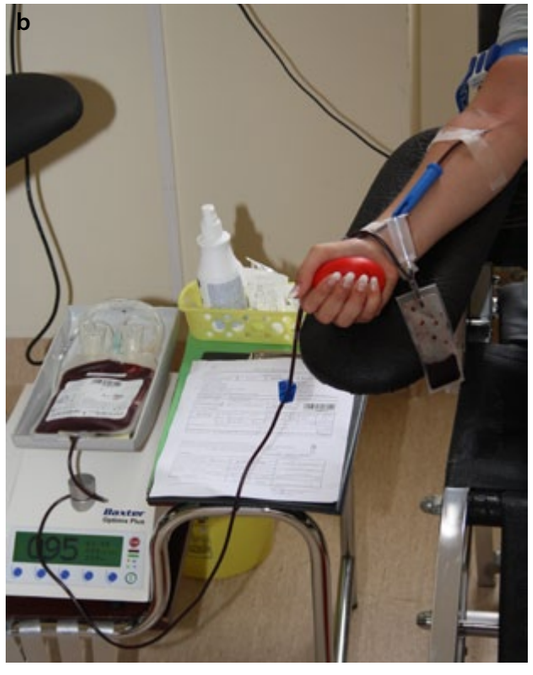
According to the Decree of the Ministry of Health 3/2005. (II. 10) the age of the blood donor is between 18–65 years (regular blood donor) and between 18–60 years (first donation), weighs more than 50 kg, haemoglobin levels in women > 125 g / l, men> 135 g / l (Pictures 1. a, b.).

Transfusion can be performed by a blood product coming from a blood donor who considers himself healthy, who has a written declaration (submitting a query) about it and who has been found healthy during the tests which have been carried out according to the regulations as well as having a negative result concerning infectious agent screening studies (HBsAg, HIV, hepatitis B and C viruses and antibodies against Treponema) and the donor is investigated from blood group serology aspect. The regular, pre-donation testing are as follows: haemoglobin determination, AB0-blood group determination of the first blood donors, the general and health status of the skin and mucous membranes of the examined person, especially the potential, typical injection sites to view, blood pressure and pulse testing, listening to heart and lung. On the basis of the information obtained from the questionnaire and test, the doctor in accordance with the 3 / 2005. (II. 10) Regulation of the Ministry of Health and the content of OVSZ methodological letter will decide whether blood donation can take place or not. There are certain conditions, illnesses, lifestyle, medication which exclude the donor from blood donations currently, durably or permanently.

Patient information after donating blood

The blood donor should be advised of the following:

- Lie down for a few minutes after blood donation
- leave the dressing on blood puncture for 4 hours, if the puncture site is bleeding, put pressure on it
- hazardous activities should not be carried out for 12 hours
- do not smoke for 1-2 hours
- drink more fluids than usual, and dine within 4 hours after blood donation
- If you feel dizzy, sit down, so that your head can be placed between your knees, or lie down
- If a complaint arises concerning blood donation, or you become ill within 6 weeks, notify the competent donation service



Pictures 1. a, b. Blood donation

Investigation of blood products

In Hungary, the AB0 and Rh D blood group determination takes place in case of every unit of blood. According to internal procedures of blood donations, *antibody screening, determination of Rh phenotype (CCEE), Kell-Antigen* take place. Further antigen testing may be necessary. Worldwide there are about the same screening tests for infectious agents done. In this context, concerning all blood donations, examinations/tests for hepatitis B virus-linked antigen (anti-HBc antibody in case of the first blood donors), hepatitis C virus antibody, HIV I / II virus antibody, antibody tests for syphilis bacteria are carried out. Besides the regular screening tests, tests are carried out for other agents (e.g. climatic, epidemiologic factors) for other reasons. The justification for additional tests must be judged related to the epidemiological data of the population by the responsible authority.

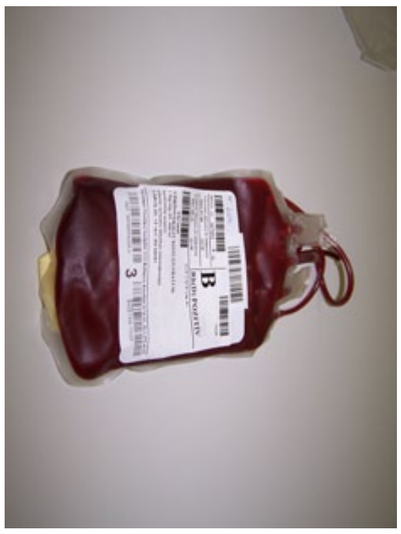
Production of blood products from whole blood and by the apheresis technique

The production of labile blood products takes place by separation of the whole blood collected into components or by apheresis procedure.

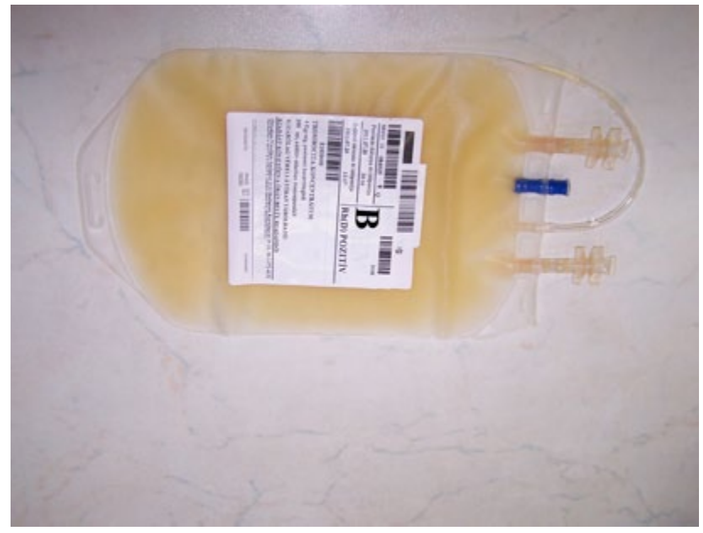
A single unit red cell concentrate (Picture 2), *fresh frozen plasma* (FFP) (Picture 3) and *platelet concentrate* (Picture 4) can be prepared from the whole blood collected.

White cell concentrate is produced only on request, by apheresis technology in the designated OVSZ-blood donation service.

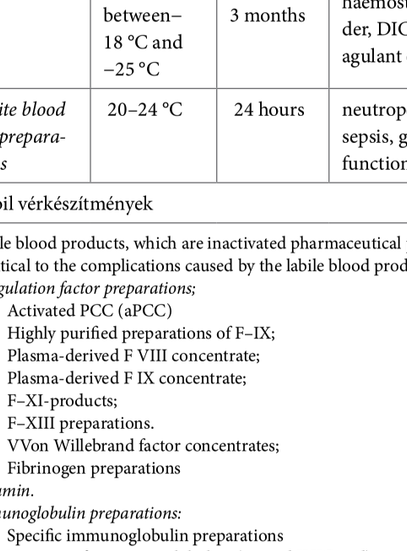
The stable, pharmaceutical, virus inactivated preparations are produced by plasma fractionating procedure from fresh-frozen plasma in pharmaceutical conditions *(Table 1)*.



Picture 2. Erythrocyte preparation



Picture 4. Platelet Concentrates



Picture 3. Fresh-frozen plasma

Information on blood preparations

Forms of autologous transfusion

This method of transfusion can be administered in case of surgery/operations which can be planned (e.g. cardiac, gynaecological and orthopaedic surgery) for healthy (patients with

Table 1. Blood products (Source: Transfusion Regulation 2008)

Labile blood products									
name of blood preparation	storage temperature	expiry date	major indications	types	blood preparations produced by special technique	administration can be started	temperature of administration	deadline of administration after the termination of controlled storage conditions	special considerations
Erythrocyte preparations	+4±2 °C	35 days	improvement of oxygen supply in tissue, improvement of oxygen transport	Red blood cell concentrate, boundary layer-free, in additive solution, red blood cell concentrate, from apheresis	washed / /medium changed; restored, white blood cell-exempt; split; radiated	must be heated to a temperature between 20-37 ° C	20–37 °C	start of administration within 1 hour, termination after 6 hours at the latest	
platelet preparations	+22±2 °C	5 days	bleeding or its imminent danger (thrombocytopenia, thrombocytopathy	Thrombocyte concentrate a single individual or pooled multi-unit, Thrombocyte concentrate from apheresis	medium changed white blood cell exempted, reduced volume, radiated	immediately	20–24 °C	start of administration within 1 hour, termination after 6 hours at the latest	
plasma preparation	below −25 °C	24 months	bleeding, clotting factor deficiency, haemostasis disorder, DIC, anticoagulant overdose	fresh frozen plasma(FFP). Fresh frozen plasma (FFP) from apheresis	depleted cells, split, radiated	melt it in 37 °C water bath, together with the protective sack, slight movement during heating	20–37 °C	immediately after heating	the labile coagulation factors are rapidly inactivated
	between– 18 °C and −25 °C	3 months							
White blood cell preparations	20–24 °C	24 hours	neutropenia, sepsis, granulocyte function disorder	white blood cell concentrateby apheresis		as soon as possible, keeping at 20-24 ° C without moving	20–24 °C	as quickly as possible and within 24 hours	slow number of drops
Stabil vérkészítmények									
Stable blood products, which are inactivated pharmaceutical products, are processed from plasma. The products must be applied according to the factory guidelines approved by the pharmaceutical authority. As the risks are identical to the complications caused by the labile blood products, therefore their treatment is the same. Here the major plasma-derived blood products will be presented: *Coagulation factor preparations;* • Activated PCC (aPCC) • Highly purified preparations of F–IX; • Plasma-derived F VIII concentrate; • Plasma-derived F IX concentrate; • F–XI-products; • F–XIII preparations. • VVon Willebrand factor concentrates; • Fibrinogen preparations *Albumin.* *Immunoglobulin preparations:* • Specific immunoglobulin preparations • Non-specific immunoglobulins (im and IVIG and).									

a rare blood type, multiple immunized patients, tissue and organ donors), or religious and moral reasons.

- Preoperative blood collection
- Perioperative haemodilution
- Intraoperative blood-free
- Post-operative blood-free

Artificial oxygen carriers (artificial blood)

Fluorinated hydrocarbons (PFCs) as well as animal and human haemoglobin preparations are included in the two main groups of artificial oxygen carriers. In clinical practice, however, there is no routinely used artificial blood which does not harm the recipient. In many cases nurses meet the patients and their families' enquiring why there is no possibility for this procedure (to replace blood with artificial blood) in the case of temporary blood shortage, or because of ethical issues are some of the reasons why this procedure is not available.

Directed donation

We are talking about directed blood donation when the blood donor allows his blood to be given to a specific patient and the blood product meets the applicable standards, as well as there is no ground for refusal between the donor and recipient.

Storage of blood products in blood depot and blood products transport

The blood products should be stored at temperatures indicated on their labels. The red blood cells and plasma products are must be stored in cooling or rather refrigeration equipment/chamber regular for this purpose and has to be controlled (in a blood storage bank, as well). The red blood cells have to be stored at +4+/ – 2° C, while the FFP has to be stored below –18 °C.

Platelet preparation can exclusively be stored shaking, in gas-permeable bags in the blood storage bank for 5 days, at +20-24° C. The malfunction indicator light and audio alarm shall be provided in the blood storage refrigerator space and the alarm is expected to indicate where the 24-hour supervision is provided. The ice formed in the refrigerator must be defrosted as necessary, cleaning and disinfection have to be done in compliance with regulations of the hygiene and health care institution in a documented way. A cooler bag with cooling elements can be used for the transport of blood products. Special attention should be paid to the red blood cell products not to be directly in contact with the cooling elements because it may cause haemolysis.

The white blood cell preparations should be stored at 20 to 24 °C without being moved, and should be used within 24 hours after production. Platelet preparations should be delivered without a cooling element at 20–24 °C. FFP (fresh frozen plasma) should be transported in a cooler bag. After defrosting it is strictly prohibited to freeze it again.

Compatibility test

The aim of the series of tests prior to transfusion is to assess the current immunohaematological status of the patient so that the transfusion of incompatible blood products could be prevented.

The laboratory blood-typing (AB0 and Rh D determination and control), *direct antiglobulin test* (DAT), *antibody screening* (detection of clinically significant irregular antibodies), *antibody identification* (a positive antibody screen only), and *laboratory cross-matching* (in case of demand of selected red blood cell product) belong to the series of tests.

Laboratory blood-typing/blood group determination

Before the planned transfusion two-sided laboratory AB0 and Rh D determination is required, during which the AB0 and Rh D antigen feature on the surface of the red blood cells and the regular anti-A and anti-B antibodies in the serum are defined (Figure 20-21.). At the same time with the laboratory blood group determination, antibody screening should be performed from the patient's blood sample as well as the direct Coombs test for the sake of detecting clinically significant, irregular antibodies influencing transfusion.

The validity of compatibility tests

The recipient's AB0 and Rh D blood type can only be established if it is determined by two different people at two different times, in two blood samples using two different methods (known as laboratory and clinical, otherwise referred to as "bedside" blood group determination) with the same results. If the results of the two determinations differ from each other, the clinical "bedside" test, using a new blood sample, must be performed again. Transfusiology consultation should be requested in writing in case of further discrepancy. Transfusion can be started in the absence of laboratory blood group determination, on the basis of clinical determination of blood group, only in urgent cases to avert endangerment of life.

Things to be done prior to transfusion

Survey

The prescription of transfusion and of the required quantity of blood product in each case belongs to medical competence. Therefore, the patient examination required for the indication of transfusion is carried out by a doctor.

During the survey related to transfusion therapy, the nurse is responsible for the compilation of the nursing plan which can assure uncomplicated, effective and duly executed transfusion therapy to the largest potential extent. Therefore:

- When recording anamnesis, ask the patient about his complaints and his history of transfusion.
- Make sure that blood product has been ordered to the specifications properly.
- Understand if the oral and written information provided by the doctor for the patient or legal representative has happened, as well as if the patient or legal representative has given written consent related to transfusion therapy.
- Assess what type and amount of blood product to be administered have been ordered by the physician and the time he has prescribed for the administration of blood transfusion.
- Understand what further measures are required to comply with the prescribed time period (use of blood warmers, suitable pressure gauge to provide excess pressure). Daily schedule steadily, not at night, if you do not have to.
- Understand if the patient monitoring is either the task of the doctor or the nurses in this case of prescribed transfusion therapy
- Understand what physical examination and laboratory tests should be carried out by the nurse prior to transfusion therapy.

Administrative tasks

The patient has to sign the declaration of consent, which has to be attached to the patient's documentation, prior to the commencement of transfusion. Before, during and after blood transfusion the following documents must be completed: test application form, blood product request form (a copy of which must be preserved), transfusion reporting form, transfusion logs and medical and nursing documentation, transfusion also has to be marked on the temperature chart. The transfusion diary - regardless of other liabilities relating to the health records –has to record the ordering physician's name, the signature of the executive person, the data of the blood product (the time of delivery, identification number, name or code of the blood product; volume, AB0 and Rh D blood group data, the date of administration , the cause of potential incapacity, the destruction/ return time) and the recipient's data (name, personal identification information, AB0 and Rh D blood group; detected irregular antibodies) and any details of potential transfusion complications.

The person carrying out the transfusion fills in the transfusion log daily, continuously. The doctors, responsible for the transfusion, in the ward as well as in the health care facility are responsible for proper log management. The transfusion log must be kept up to date daily, summarized, post-entry of each event is prohibited! The log shall be kept for the existing statutory period of time (currently 30 years), according to the institution's document management procedures.

After transfusion – or when sending back the unsuitable transfusion blood product – the transfusion report card has to be completed and sent to the OVSZ blood bank which is responsible for the area keeping the deadline (deadline: transfusion without complications: 1 month, severe transfusion reaction/complication: 48 hours). The record of any occurrence of serious adverse reactions of transfusion must be made and sent to the doctor responsible for transfusion in the hospital and to the local blood storage bank of the OVSZ.

The pre-transfusion checks and identifications

Patients must be identified before any intervention. The patient who is able to communicate should be asked to give key personal particulars (patient's name, date of birth, mother's maiden name). A patient who is unable to communicate can be identified by his hospital identification number and by the indication of their gender. The identification data must match the patient's documentation and data on their wrist band. If the patient's identity, which was unknown at the time of application for laboratory blood grouping/ blood product, was clarified in the meantime, the transfusion department must be notified about the data in writing. Prior to transfusion it should be checked if the product is suitable for transfusion according to the below mentioned list:

- Check the product expiration date, and the intactness of segments and of the bag and the fact if the numbers match on them. The number has to be indicated in the patient's documentation. The data congruence on the transfusion report card (and in case of transfusion with selected blood on the certificate) must also be checked.
- Check if the type, quantity and kind of blood product is the same as that of which was prescribed.
- Macroscopic control must be performed (when the product arrives at the transfusion department, then when it is issued, and prior to transfusion, as well): clump, fibrous mesh, mould, resuspending solution and boundary blurring of the red blood cell, the colour abnormality of the product, for example lacquer-like or reddish discolouration, suspected haemolysis, lipaemia (appearance similar to bacterial or fungal infection).

Blood group/ application for blood selection

Tthe appropriate blood product request, should be undertaken and indicated by the doctor on the basis of the patient's condition, and that the request form should be filled out, printed and sent to the blood bank.

Prior to the application *two blood tubes of the recipients' blood* should be collected, one of which must be sent to the competent blood bank and one with the notice of "pre-transfusion blood samples" must be maintained for 48 hours after the transfusion at +4 °, at a place in accordance with hospital standards. Next is the clinical determination of blood group, which is followed by filling the blood product request form and sending it to the blood bank.

Request for other laboratory tests

(blood count, Hb, Fe, LDH, SeBi, urine general etc.)

Before transfusion, requests for other laboratory tests are necessary depending on the patient's general condition, transfusion indication: blood count, Hb, Fe, LDH, SeBi , general urine.

Table 2. The blood request process

	steps	explanation/reasons
1.	Perform hygienic hand disinfection, wear rubber gloves	In compliance with the rules of asepsis, antisepsis, and for the self protection of the staff
2.	Collect two tubes of the recipients' blood samples before blood request, one of which is sent to the blood bank, the other labelled "pre-transfusion blood sample" is kept for 48 hours after the blood transfusion at +4 ° C. Several tubes of blood must be taken when two tubes of blood are requested by the blood bank for blood-choice, anti-body identification purposes, and furthermore one more recipient tube is requested if the clinical blood group determination is carried out by plate method. Impaired blood coagulation must be sent (e.g.in a blue or purple blood collection tube), if the laboratory blood-grouping is needed within 1 hour. Mark the blood samples in accordance with the protocol (patient's name, social insurance number, date of birth) immediately after taking blood at patient's bedside. On the test tube do not write your own name, but the documentation should include the name of the blood collector. You may need other laboratory tests as required by the transfusion indication and the patient's condition: haemoglobin level, red blood cell count, general urinalysis check.	Laboratory blood typing takes place from the one / two tubes, from the blood which remained in the hospital/clinic, plate blood determination can be carried out. In case of transfusion reaction you may need examination from the blood taken after transfusion. It is important to mark the sample at the patient's bedside to avoid human errors.
3.	Perform the clinical blood-typing, which is done according to institutional protocols by plate or card (bed-side) method. Record the results on the test request form and the blood product request form (a copy of which must be preserved), then in the transfusion log and in the medical and nursing records/documentation.	This will help to investigate the cause of potential complications. According to the 2008 transfusion policy cross-matching is no longer required to be performed.
4.	Request the appropriate blood product, which is indicated by the doctor on the basis of the patient's condition, by completing the request form, printing it and sending it to the blood bank. Blood product-request forms must include the following information: patient's name, date of birth, social insurance number, diagnosis, ICD code, blood type, blood product type, quantity, the name of the institution and department name and number, doctor's name, seal number, and in the case of selected blood transfusion, the transfusion medical history (previous transfusion, transfusion complications, organ, tissue transplantation, artificial immunization with red blood cells, pregnancy, childbirth, anti-D IgG treatment) relating data, etc.. The Blood request must be documented to include transfusion logs, medical and nursing documentation.	

Clinical blood group determination for blood group request

The AB0 and Rh D blood group determination of the patient prior to all transfusions (in case of both selected and non-selected blood) is required and should be performed. The results should be recorded in the unit transfusion logs, on the transfusion report card, on the transfusion form, on the temperature chart, in the medical and nursing documentation according to the institutional protocol. The clinical "bedside" blood group determination, as it is also apparent from the description, must be carried out close to the patient (e.g. ward, examining room, operating room) from the blood sample taken immediately prior to the administration of the transfusion. The clinical "bedside" blood-typing results must be preserved for 48 hours after the test.

In case of the card procedure, blood should be dropped on the dry reagent by adding physiological saline solution, you have to wait for about 1 minute for the results (31images). In case of the plate method, larger quantity of blood is needed, to which the reagents are dropped after making 10% suspension.

Card (bed-side) blood-typing protocol

Tools/devices to be prepared:

- Plastic trays
- 10 sterile single-use blood collection needle / lancet punching finger pad
- 10 x 7-10 ml test tubes with closed system(native, EDTA, sodium citrate)
- test tube rack
- Non-sterile rubber gloves
- Tourniquet (because of the aseptic technique it is recommended to use non-textile material that can be cleaned after each patient)
- Antiseptic skin preparation
- 1 package of sterile chopped gauze, swab
- Band-Aid
- Bed protection
- 10 eyedropper or disposable pipette
- 5 x 10 ml isotonic sodium chloride
- 1 pen (not water-soluble)
- AB0 and Rh D blood grouping card should be stored according to the manufacturer's description for determination of card (bed-side) blood-grouping.

Table 3. Card blood group determination

	Steps	Explanation
1.	Perform hygiene hand disinfection, wear rubber gloves.	In compliance with the rules of asepsis, antisepsis, and for the self protection of the staff
2.	Tear open the foil packaging, remove the dual cards.	
3.	If you perform a self-test then you tear the dual card along the perforation.	
4.	Write down the patient's or blood donor's data on the card.	For the purpose of patient identification and product identification, since the card should be retained (it is especially important in case of potential complications).
5.	Disinfect one finger pad of the patient in accordance with the protocol, then punch it for taking the blood sample. Blood products: select the test segment from the preparation	***Attention!*** Pre/transfusion blood samples in case is required
6.	Drop the sample materials on the reaction field: – Patient Sample: Drop 1-1 drops (50 µl), by a recipient blood pipette, or directly from the fingertip to the first row reaction field. Each reaction field should have added a drop of saline. – Donor sample (tube segment) Drop 1-1 drop (50 µl) donor blood on the reaction fields in the first row. Each reaction field should have added a drop of saline. – Auto Control: It is recommended that the field with "Blut-BLOOD" notice should be used as auto-control box in each row, for this purpose a drop of saline and a drop of blood from donor or recipient must be dropped on the field.	The validity of the test result is provided by the auto control when the auto control-field shows agglutination, the result is not valid and a new test is required.

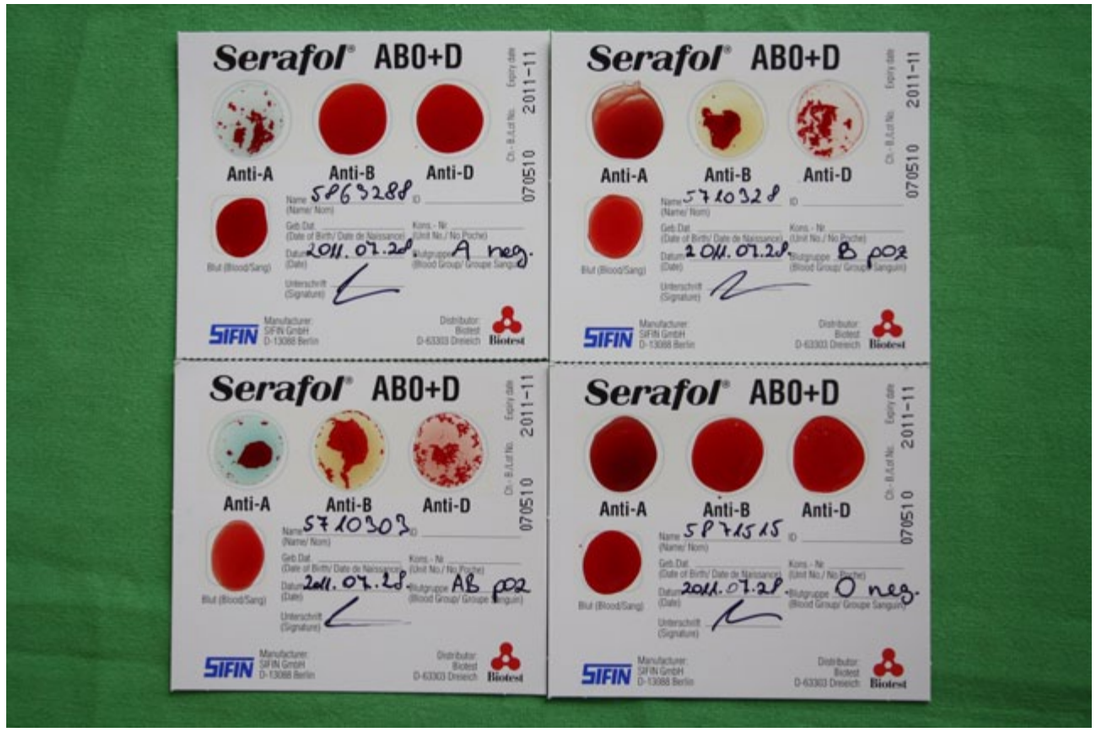
7.	Give the patient a swab to put it on the site of injection.	
8.	Do not allow the blood get dry therefore you need to work quickly	If it gets dry, the test will not be suitable for assessment
9.	Stir every reaction field for about half a minute with a stirring rod, while the reagent is completely dissolved, the stirring should be performed to the edge of the reaction field.	A new mixer end has to be used for each reaction field or the rod has to be cleaned between each field because it may take anti-body contamination with itself.
10.	For approximately 30-60 seconds overturn the card gently, so that the droplets should move in a circular way.	
11.	The test fields should be tested for agglutination immediately with the results being written on the card. An evaluation of the reaction should be recorded: – Agglutination: positive reaction. – No agglutination: negative reaction If agglutination is experienced only in the anti-A-box/ field (the blood drop becomes grainy), then the patient's blood is A-blood type, if only in the anti-B-box, then B, if both, then AB, and if none, then 0 blood type. If precipitation is detected in the anti-D-field, the Rh D-positive, while in the absence of precipitation Rh D-negative is the patient's blood group outcome. If the precipitation is observed in the auto control field, the test is invalid	The transfusion must not be performed if the results of the tests performed on the bed-side card with the blood of the donor and the recipient are not identical and the differences show incompatibilities. The cause of incompatible differences should be promptly investigated and a professional transfusion specialist must be consulted with. In case of compatible differences (e.g. recipient A gets 0 red blood cell product) a transfusion can be carried out according to the rules of the profession

anti-A	anti-B	anti-D	Blood group
			A Rh D+
			A Rh D-
			B Rh D+
			B Rh D-
			AB Rh D+
			AB Rh D-
			0 Rh D+
			0 Rh-
the sign of precipitation  ,there is no precipitation:)			

12.	Do order the patient's environment. Selectively treat the created waste Dokumentálási céllal a reakcióoldatot Perform hygiene hand disinfection	
13.	Record the process in the transfusion log, in the medical and nursing documentation. If the transfusion was successful, the date should be recorded and signed by the physician. The reaction solution must be dried on the test card for the sake of the documentation, it must be covered with self-adhesive, transparent foil. During drying the card must be in a horizontal position.	

- In the case of plate blood-typing a piece of blood grouping tile (or opaque white plastic sheet), 2 (glass or plastic) rods, and should be stored in the refrigerator: anti-A-test serum, anti-B-test serum, anti-AB-test serum, IgM-type anti-D-test serum and Rh control.
- Documentation (application form for blood products and blood product request form (a copy of which must be retained), serological diary, transfusion form, transfusion logs and medical and nursing documentation

There is another protocol of card (bed-side) blood-grouping where the physiological solution is dropped on the card first, this is followed by a drop of blood, i.e. the two procedures are identical until the 4th step. After dropping 1-1 drop on the test field, it is followed by skin disinfection, and punching/injecting the fingers. The 7th step is dropping the blood on' Blut-Blood "field of the card, with the rod being dipped into the blood drop. After this, the rod end with the blood adhered must be dipped into the saline or water droplets on the field with anti-test reagent and mixed (to the edge of the circle) until the test reagent is dissolved (about 15 seconds), it is necessary to repeat this in the case of the anti-B (or anti-B and anti-D) test reagents with another mixer. Leave the card lying for 30 seconds, and the next steps are the same as those described above (10-13).



Picture 5. Results of card blood group determination (A-,B+ and 0-)

Documentation of blood request

The following particulars should appear on the label of the tube containing the blood sample:

- The patient's name;
- Date of birth and / or Social Security number (in case of a foreign person, the patient's insurance number);
- Date and time of sampling;
- The code of the institution which has sent it.

If the patient's identity is unknown, then the label of the tube should contain the following data

- The patient's gender;
- The patient's hospital identification number;
- The sender's institution code;
- The sampling date and time.

Blood product-application form must include the following information

- The patient's name, birth date, Social Security number, ICD diagnosis code and blood group;
- The required type and amount of blood products;
- Submitting institution / department, its name and code
- The doctor's name and number of seal
- Furthermore, in case of selected blood, transfusion history (previous transfusion, transfusion complications, organ, tissue transplantation, artificial immunization made with red blood cells, pregnancy, delivery, anti-D IgG treatment) and relating data.

Special blood products (washed / medium changed; restored, white blood cells-free; produced by apheresis products; irradiated; shared, rare antigen properties) can be stocked in a limited way, their production and transportation may take several hours. Therefore, when claiming these products, the local OVSZ blood bank should be consulted. If the patient requires special blood products, the fact should be recorded in the patient's documentation so that in the future, if necessary, the same characteristics (type of) blood product can be requested.

Finally, the procedure is to be documented in the transfusion log, in medical and nursing records.

The blood-group control of blood products

The AB0 and Rh D blood-group determination is required to perform before transfusion concerning red blood cell products (for both not selected and selected blood products). For this test, the blood in the numbered plastic tube section (segment) is available without opening the blood product. Segments do not belong to some blood products, in this case the blood group determination can be performed from the leaking blood (flowing out) during the assembly of the blood product and transfusion tubing

Clinical cross-matching

It is a change compared to the former situation that cross-matching does not have to be performed at all because of its uncertainty, even when non-selected blood is administered (Transfusion Rules 2008.). It did not show 50% of the antibodies causing complications (only a part of the direct agglutinating antibodies is detectable by the procedure), its aim can be achieved by the exact identification of the patient and blood product as well as the blood group definition of the patient and blood product before blood transfusion.

Administration of Transfusion

The preparations include patient information, patient identification and blood product identification, blood products macroscopic control, blood sampling prior to blood transfusions, the clinical blood group determination of the recipient's and donor's blood directly prior to blood transfusion, connecting the products with wedge mounts and monitoring the patient's vital parameters.

The construction part of the transfusion includes disinfection vein puncture, the biological test, and then setting the number of drops, and observation.

Biological test:

At the start of blood transfusion, or at administration of several units of blood, when connecting each unit a"biological test" should be be performed during which concerning adults the first 25 ml (newborns 1 ml, infants / children 3-5ml, depending on body weight) must be transfused in ray, the transfusion must be set for slow drip number and the patient should be observed closely for 15 minutes. The biological test cannot be evaluated or only in a restricted way concerning patients unable to communicate (eg. The fallen patient , somnolent, unconscious, comatosed, anesthetized) or hypothermic patients and newborns, infants, young children, the elderly. After the negative biological test, the final "normal" number of drops, 40-60/min. can be adjusted.

The nurse should observe the patient during the entire period of blood transfusion and at least for two hours after it. In these cases, the physician who is responsible for the transfusion is responsible for monitoring the patient: massive transfusion, shock, or urgent transfusion. The observation (patient identification and recognition of complications) is more difficult for certain age groups (newborns, infants and young children, elderly) and patients with specific conditions, listed in the earlier paragraph.

The task after transfusion is to check vital signs, general observation (urine volume, colour), and administrative tasks (transfusion log/journal, reporting sheets), and laboratory tests if necessary.

In most countries, under the current transfusion policy it is prohibited to add medication (e.g. 5% dextrose solution causes haemolysis, calcium solution results in blood clotting), infusion, or any other material and it should be connected only to the vein which is not in use for other purposes at the same time. However, in some countries –in accordance with strict limitations - concerning certain active substances, other regulations are in force, so it is necessary to act in accordance with the requirements of the given country.

The protocol of transfusion therapy

Devices to be prepared:

- 1 plastic tray
- Bedside blood grouping tools
- Blood products at a suitable temperature
- 10 ml physiological salt solution, to flush out the catheter
- 10 sterile single-use blood collection needle
- 10 x 70-10 ml tubes contained (native, EDTA, sodium citrate) tube rack
- 2 pairs of non-sterile gloves
- 2 catheters
- Transfusion tubing
- Infusion stand
- Tourniquet (non-textile material is recommended because of the aseptic technique that can be cleaned after each patient.)
- Antiseptic skin preparation
- Chopped 1 package sterile gauze, swab
- Band-Aid
- Bed protection
- Thermometer
- Blood Pressure
- pulsoxymetry
- Documentation (application form for blood products and blood product request form (a copy of which must be retained), serological diary, transfusion form, transfusion logs and medical and nursing documentation

Special Devices:

Transfusion tubing (mount) which can be used for transfusion therapy is standard (150–200 µm pore diameter) or applied with micro aggregate (40 µm pore diameter) filter (the latter is used e.g. for massive transfusion), it is compatible with sterile, disposable, pyrogen-free, plastic blood bag. In Hungary, new tubing must be used for transfusions of each new unit (bag) of blood product. *(Picture 6)*.

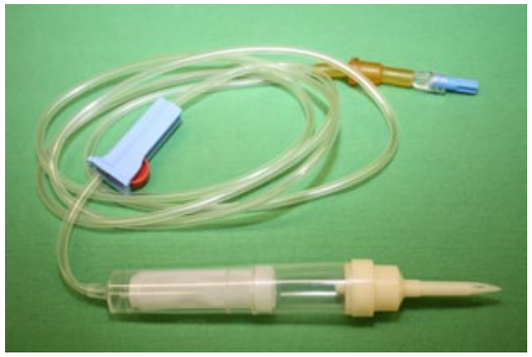
A device with a pressure gauge can be used for massive transfusion therapy. For this purpose, the infusion pump which is not harmful to red blood cells may be used. The maximum pressure can be 300 mm Hg so that the risk of damage to red blood cells can be reduced. During the process continuous and increased patient observation is needed.

During transfusion the application of a syringe attached to the transfusion tubing may be necessary (e.g. in the case of newborns). In this case, the blood product is to be supplied from the bag of blood to the syringe which has to be connected to transfusion tubing and with the removal of any air being undertaken. This increases the risk of human errors, so special attention should be exercised.

When commencing transfusion, the temperature of the blood product should be between 20 ° C and 37 ° C (blood product with temperature higher than 40 ° C can result in severe transfusion reaction such as haemolysis, haemoglobinuria, or even kidney failure.). To ensure the appropriate temperature *heating the blood product* is required (platelet preparations can be used immediately and not be heated). As the temperature of blood product reaches the required temperature, the administration of it should be started immediately so that the required temperature during the transfusion is provided.

Room temperature blood should be used for normal blood transfusions. For some groups of patients, however, it is recommended to use a blood-warming device. This device allows precise control (limiting both overheating and cooling) fast (the device reaches its operating temperature in about 2 minutes) and dry warm-up (Picture 35). The device displays the current temperature which can be constantly monitored, as well as audible alerts can help prevent the transfusion of blood product with an inappropriate temperature. Regular maintenance and proper functioning of the alarm system should include regular monitoring. Heating the blood product in an intact and sealed, protective sachet/bag is possible in a water bath at 37 °C, as well. The water temperature should be monitored continuously and the blood product must be covered by water so that it cannot reach the bag outlet. In this heating mode, heat up time of 1 E red blood cell concentrate is about 10-15 minutes. It is prohibited, for the purpose of shortening the heating time or for any other reasons, to perform heating in any other ways, for example under warm running water, on the stove, in microwave oven, etc.
Heated (37 ° C) red blood cell concentrate is to be given:

- for rapid and massive transfusion to prevent and treat cooling, with the adult patient should be administered more than 50 ml / kg / hour blood, and with children blood should be administere at a rate of more than 15 ml / kg / hour blood
- hypothermia and burn patients
- Cold-type autoimmune haemolytic anaemia



Picture 6. Transfusion tubing

- Intrauterine transfusions, blood exchange, transfusion of premature and newborn babies
- Cryopathia (e.g. the presence of cold agglutinin), if a patient is clinically proven to suffer from cold agglutinin disease, an autoimmune haemolytic anaemia, in which the IgM antibodies connected to red blood cells cause their destruction.

Special Forms of Transfusion

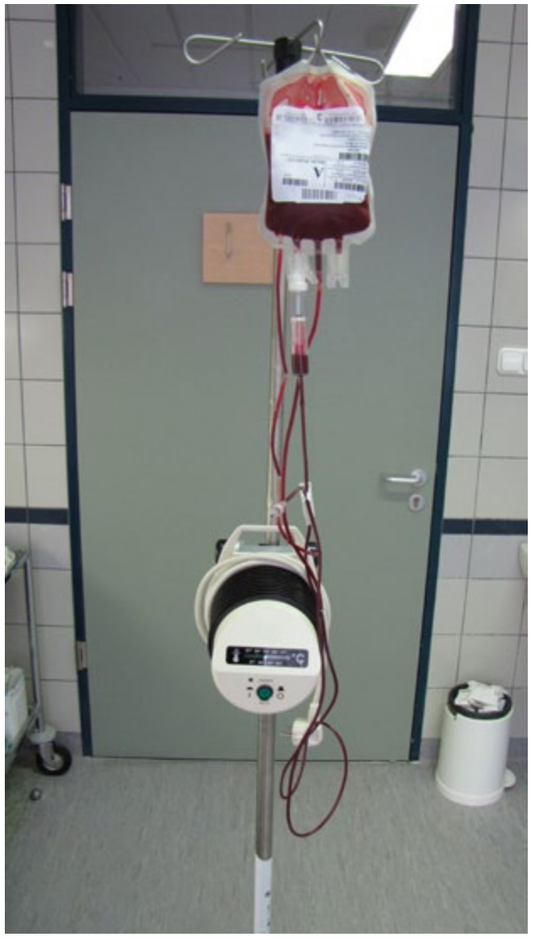
Urgent transfusion

In order to perform a successful and uncomplicated transfusion therapy, you should aim at keeping the general rules of blood group determination, that is the blood group determination should be performed by two different persons with different methods (clinical and laboratory blood group determination). Therefore, if the patient's condition allows it, the volume replacement should be started immediately with crystalline solution (crystalloid) or if necessary, with a colloid solution to save time for blood group determination.

It is an important nursing duty that blood samples must be taken prior to the commencement of volume replacement for blood group determination and other laboratory tests. In addition, another important task for the nurse to prevent, are possible severe allergic reactions (the administration of infusion must be started with low drop number while the patient is closely observed) and the preparation for the treatment of allergic reactions (the preparation of the standby tray and the regular check of its content).

Another possibility is that in urgent cases, with life-saving purposes, when there is no option to comply with the general rule, that is –for the bedside blood grouping, then blood type 0, preferably, Rh D negative red blood cell concentrate can be given.

In this case, a maximum of 2 units of red cell concentrates may be administered. It is an important nursing task, however, that in these cases it is also mandatory to take blood samples



Picture 7. Blood heating device

for laboratory blood group serology testing prior to transfusions and besides indicating the usual data, to send it to the laboratory tagged "urgent".

Only in exceptional circumstances (mass disaster, war), if necessary, the physician may decide to abandon the clinical Rh (D) determination and the laboratory AB0 and Rh D blood group determination where appropriate. The bedside donor and recipient AB0 blood group determinations in such cases is always mandatory.

Massive transfusion

The replacement of the blood loss takes place by exchanging the circulating blood volume during 24-hour period. For adults at least 10 units of red blood cell concentrate are administered. Massive transfusion (usually 90Hgmm) should be performed with excess pressure, and blood products need to be heated (usually 37 ° C).

Table 4. Transfusion administration

	Steps	Explanation
1	Perform hygienic hand disinfection.	In compliance with the rules of asepsis, antisepsis.
2.	Prepare devices required for transfusion	
3.	Wear rubber gloves.	For self protection of the staff
4.	Check the blood product label for expiry date, if the bag and tube sections are not damaged, and if the data are the same on the blood bag, on blood-group serological results and on the transfusion report card. In the case of the chosen blood, check if the proof of the blood choice corresponds to the patient's data, and keep the blood group –serological results attached to the blood product in a place within easy reach. Check also if the blood product type, its kind and its quantity corresponds to the requested one.	Blood products can be issued and used only within the expiry date, when stored in accordance with the standards and are labelled The dark colour of red blood cell product refers to haemolysis You do not have to perform AB0 and Rh D determinations from the FFP, the platelet and white blood cell-derived products.
5.	The matrices, which are attached to the blood product by the blood bank, containing the identification code of the blood product should be stuck to the following documents: the copy of the blood product request form, transfusion reporting sheet, temperature chart, transfusion log, medical documentation in accordance with the institutional protocol	
6.	The administration of blood products must be started after the controlled storage within an hour and must be completed in 6 hours at the latest. The red cell product should be kept at room temperature after cooled storage and transportation for up to one hour so that it could get warm for administration temperature. In some cases, the administration of red blood cell concentrate heated to 37 ° C is required. Other blood products should be stored and transported at the temperature and in a way as previously described. The administration of heated blood products should be commenced immediately.	After warming and thawing the labile coagulation factors in the FFP are rapidly inactivated and therefore it should be administered immediately after heating.
7.	Identify the patient and prepare them psychologically for the procedure: inform the patient about the procedure; any possible complications so that they can tolerate the process in a more relaxed and better prepared way, encourage them to inform the staff immediately if they feel anxious, or experience adverse reactions such as shivering, flushing, pain and shortness of breath. Inform the patient after the doctor's medical explanation and after signing the consent.	
8.	Ask the patient to micturate or empty the urine collection bag. Take a urine sample from the patient, check the presence of blood by test strips, and tell the doctor about the results, furthermore document it. 48 hours after the transfusion the patient's urine should be monitored and checked, but it need not be preserved.	In case of transfusion complications it is necessary to ensure fresh urine sample. In case of haemolytic reaction, red blood cell, haemoglobin, indirect bilirubin testing and observation of the colour of urine are required.
9.	Prepare the patient for the procedure by proper body position (lying, or Fowler-position depending on the patient's condition), by monitoring the vital parameters: blood pressure, pulse, temperature (neonates: temperature, pulse, respiratory rate), and by documenting them. If the readings deviate from normal, the doctor must be informed. The patient should preferably be placed so that you could observe him closely, that is near to the nursing station, to the part of the ward which can be seen from the corridor.	If the vital parameters are not within the normal range, the doctor may prescribe certain procedures before commencing the transfusion (such as lowering blood pressure, relief of fever)

10.	Perform hygiene hand disinfection, and put on rubber gloves.	In order to keep the rules of asepsis, antisepsis and for the staff's own protection
11.	Check the blood products received from the blood bank: if macroscopic lesions (e.g. blood clots, colour) can be seen. Blood products considered unsuitable for transfusion should be isolated immediately and shall be written on the bag that 'INAPPLICABLE FOR TRANSFUSION' ' and should be returned to the blood bank with indication of the reason for inadequacy. Make the clinical bedside blood group determination, from the segments of the patient as well as of the red blood cell products. Compare the patient's clinical blood group with the laboratory blood group determination and blood group serological results returned from the blood bank as well as with the data on the blood product. If there is no blood of the same group or it cannot be given for serological reasons, it is indicated by the blood bank and it usually sends washed blood products which can be administered to the patient without complications (e.g. washed A-blood type red blood cell preparation can be sent for an AB blood type patient by the blood bank).	
12.	Open the plastic bag of tubing, then take the tubing out of it and place it on the unfolded bag.	
13.	Close the drop counter. If the drop counter does not close properly, close the administering line with a pair of artery forceps.	
14.	Open the intact diaphragm outlet of the bag held upwards with the outgoing pipes.	
15.	Remove the protective cover of the short section, which is connected to the bag, of the tubing and pierce the diaphragm of the blood bag with a twisting motion, and fit the piercing-pen steadily into the opening.	
16.	Hang the bag on the top of (at the slot on the opposite side of the bag with the outgoing pipes) the transfusion rack.	
17.	Fill approximately half of the filtering bag of the tubing with blood by compressing it.	The final number of drops cannot be set as long as the level is higher
18.	Remove the protective cover from the end of the administering (long) shaft.	

19.	Expel air from the tubing: you let the blood slowly into the administering shaft by opening the drop regulator and /or artery forceps, preferably, avoiding creating air bubbles (if there are air bubbles, you let the blood flow until the bubble disappears). If you have not carried out the blood group determination from the segment of the bag, then take 2-3 ml of blood into a clean, dry test tube via the tubing and perform the tests from it.	
20.	Close the drop regulator (and / or artery forceps) when the administering shaft is free of bubbles,	
21.	Provide access to the transfusion respecting the rules of asepsis, antisepsis (after hygienic hand disinfection in surgical gloves so that you should not touch the part of the needle and of the tubing which should remain sterile), first select the appropriate vein (preferably in non-dominant arm, not in elbow-joint), disinfect the skin for cannulation and use a blue / pink cannula.	If possible, do not lead the cannula into the elbow-joint, as the position of the cannula and the transfusion is not safe because of the movement, bending of the arm as the cannula can pierce the vein easily. Use a cannula with a larger lumen for cannulation, because it is more difficult, risky for the red blood cells to pass through the smaller diameter, so in the case of whole blood and red blood cell concentrates, the high lumen catheter/cannula reduces the risk of haemolysis.
22.	Flush out the catheter respecting the institutional protocol (e.g. with 2 ml saline). Do not use heparin for flushing out in haematology patients.	
23.	Connect the air free tubing to the cannula. Do not give anything together with it in the same cannula.	For example, a 5% dextrose solution can cause haemolysis, calcium solution coagulation.
24.	Move the bag gently, for the purpose of the homogenization of the settled cellular blood product.	
25.	Carry out the biological tests: adults for the first 25 ml (1 ml newborns, infants / children 3-5 ml depending on body weight) should be transfused in rays, then the transfusion should be set to slow drop number and the patient must be strictly observed for15 minutes.	Complications can already occur when only a small amount of blood is administered; therefore the biological tests help to identify and to prevent them as soon as possible.
26.	After the negative biological test, set the final "normal" number of drops, so that the time of transfusion should be as it is prescribed (usually40-60/minutes or 200ml/hour).	To prevent circulatory overload, left heart failure, it is necessary to set the optimum droplet number. In case of left ventricular failure risk, if possible, reduce the amount of transfusion to 1E per 12 hours
27.	In case of need apply pressured transfusion but the pressure should not be more than 300 Hgmm	In order to reduce the risk of red blood cell damage.
28.	During blood transfusion monitor the patient and their vital parameters (if possible use a monitor for patient monitoring) and urine sample, ask if they have any complaints. In case of each patient, 30 minutes after the connection of blood, body temperature, blood pressure and heart rate testing (and the result should be recorded on the transfusion sheet) is required. In some cases, the vital signs are required to be measured more frequently.	The cardinal symptoms should be more intensively observed if the patients are anesthetized, under the influence of morphine (and similar drugs), unconscious, in shock, elderly or infant, or if the patient complains of indisposition, or may have symptoms referring to adverse transfusion reactions. Increased observation is required for patients suffering from cardiac decompensation, anaemia, and diuretic may be necessary for them to be administered.

29.	During transfusion take care of the following: transfusion rate, skin problems on the site of delivery, signs of transfusion reactions (e.g. fever, chills, tachycardia, dyspnoea, urticaria, pallor, cyanosis, pain). When the complications are observed, stop the transfusion and notify your doctor, check the vital parameters, furthermore follow the request from medical staff to alleviate and manage the patient's adverse symptoms.	
30.	Complete transfusion, remove tubing.	
31.	Check the vital parameters (blood pressure, pulse, temperature) and urine sample at the end of the transfusion.	
32.	You are expected to document (temperature chart, transfusion reporting form, transfusion log and medical documentation in accordance with the institutional protocol) the commencement and the termination of the process (and every perception of the patient observation during the procedure) and the amount of the blood intake and the urine output on the fluid balance chart. In case of chosen blood, attach the receipt of blood to the patient's documentation. After the transfusion is completed, the report form attached to the blood product is to be filled in, and must be returned to the blood bank within one month when the transfusion was complication free and within 48 hours when serious transfusion complications occurred.	
33.	For 48 hours keep the used, closed/sealed tubing and the empty blood product bag in the refrigerator dedicated for this purpose, as well as the clinical "bedside" blood-typing results having been foiled (in case of the patient's blood and blood products as well). In uncomplicated cases, make sure product is disposed of in an hazardous waste bag and disposed of appropriately.	Transzfúziós szövődmény esetén a vérkészítmény maradékát fel kell használni a szövődmény vércsoport-szerológiai és mikrobiológiai kivizsgálásához.
34.	After the transfusion, the patient must be observed for 2 hours (vital signs, symptoms, complaints), and the observations must be documented. When the patient stays in hospital, observe the patient's urine colour and volume for 48 hours after blood transfusion. If transfusion complication is suspected, inform the doctor. When patients are discharged, call the patients' and relatives' attention to the signs of delayed transfusion reaction (dark urine, paleness, jaundice) and in these cases patients should contact the doctor immediately. (Information for Patients Discharged from Hospital)	Dark-coloured urine, red urine and reduced urine output (oliguria / anuria) may indicate haemolytic reaction. Delayed haemolytic transfusion reactions usually occur within two weeks after transfusion, the symptoms of which are the reduction of haematocrit, the haemoglobin and red blood cell count decline (paleness, weakness), haemoglobinuria (dark urine) and the increase of indirect bilirubin level (jaundice).
35.	Do order the patient's environment. Selectively treat the resulting waste. Perform hygienic hand disinfection	

Picture 8. Transfusion administration

Transfusion of Newborns

During the survey of newborn babies, temperature, pulse and respiratory rate measurements from among the vital parameters should be carried out before and after each transfusion. The biological test should be carried out by administering 1 ml of blood product (3-5 ml for infants and children, depending on body weight.) When transfusing red blood cells–for newborns and premature babies – the applied red blood cell concentrate should be AB0 and Rh D-compatible, also compatible with the mother's blood samples, chosen/selected, white blood cell exempt and divided (about 50 ml).

Platelet transfusion is less frequent, the indication may be neonatal allo immune thrombocytopenia (Naite). FFP can be indicated besides the administration of vitamin – K for newborns and premature infants with bleeding event.

Neonatal exchange transfusion is carried through allantoic vein, the average volume of blood product is 170-200 ml /kg, which is suitable for the 90% replacement of the newborn's blood volume. After transfusion free antibodies, bilirubin level and DAT positivity should be checked.

Transfusion reactions, complications

Classification of complications

When classifying adverse reactions on an aetiological basis immunological (e.g. acute and delayed haemolytic transfusion reactions, immune-mediated thrombocyte destruction, allergic reaction, non-haemolytic febrile transfusion reactions, anaphylactic reactions, acute lung injury) and non-immunological (e.g. non-immunological origin haemolysis, transmission of infectious agents, sepsis, haemodilution, circulation overload, blood clotting disturbances /coagulopathies, hypothermia), while on the basis of the time, course, immediate and delayed reactions are distinguished (Table 2).

What to do if complications occur

The nurses play a very important role in the observation of transfusion reactions as they can observe the primary symptoms immediately during and after blood transfusions, they can track the patient's condition, and last but not least, can prevent bedside errors. Nurses must report the adverse reactions experienced during transfusion therapy immediately to the physician supervising the transfusion and they arrange for the treatment of established complications, as well as make a written report about the serious events and reactions to the physician responsible for transfusion, and to the relevant regional organizations of OVSZ (NBS).

When observing adverse signs of transfusion reaction:

- transfusion should be stopped;
- ensure that the reservation vein and 0.9% NaCl solution for infusion should be initiated;
- notify the physician supervising the transfusion.

In mild cases the doctor may order a special patient monitoring, medical treatment for allergic reactions (antihistamines, fever) and the resumption of transfusion with the slow drop number.

In severe cases:

- the physician orders the suspension of transfusion and the patient's adequate treatment: cardiovascular stability (shock free condition), forced diuresis (fluid intake, diuretic), inhibition of allergic reaction and its consequences (steroid, antihistamine), reduce fever by medication, central vein insurance, oxygen mask / intubation, application of monitors for patient monitoring;
- sampling:
  - from the patient: 1. one tube with anticoagulated blood sample (in EDTA tube with purple cap: Hb, free Hb, thrombocyte, haematocrit, or perhaps, in blue capped sodium citrate tube: APTI, PTI, fibrino-

Table 5. Potential complications of transfusion (Source: Transfusion Rules 2008, Thompson 2008, Boyd Tower, 1998, 2003 Petrányi; T Hainsworth 2004, Royal College of Nursing 2010)

Complication	Cause
Immediate haemolytic transfusion reaction	due to AB0 incompatibility the recipient's antibodies hemolysate the donor's red blood cells.
Non-haemolytic febrile transfusion reaction	the presence of antibodies against the donor's white blood cells
Allergic reaction	allergy against the ingredients used for preparation(WBC preparation), transferred antibodies of donor (e.g. against the plasma proteins of recipient)
Anaphylactic reaction	antibody against the administered plasma proteins (e.g. IgA)
Transfusion-associated acute lung injury (TRALI)	intake/administration of the antibodies against the recipient's white blood cells from the donor's plasma, lung damage (endothelial damage and pulmonary vascular obstruction)
Circulatory overload	the administration of the blood product is either too large or too rapid. (Increased risk: the elderly, heart patients, young people)
Sepsis	reproduction of bacteria and their endotoxins in the preparation
Delayed haemolytic reaction	breaking up of the administered red blood cells because of irregular antibodies
Alloimmunization	recipient antibodies against the donor antigens
Post-transfusion purpura (PTP)	recipient produces anti-platelet antibodies, which destroys its own platelet.
Transfusion-associated graft-versus-host disease (TA-GVHD),	the recipient's immune system does not recognize the donor's T-lymphocytes as hostile (e.g. immune suppressed patients, transfusion of relative donor) and then they proliferate in the recipient, the lymphocytes consider the proteins of the host body foreign substances, attack the patient's tissue.
Non-immunological haemolysis	expired, overheated, overcooled, infected blood product administered with excess pressure, co-administration of incompatible medications, application of infusion pump causing mechanical injury
Transmission of infectious diseases	administration of infected blood product, blood product stored for insufficient time and administered improperly (some bacteria can reproduce on-4C°), respecting the rules of asepsis, antisepsis.
Reaction caused by metabolites	administering large amounts of blood products, transfusion during various diseases (liver disease, osteoporosis). In these cases, the citrate got into via blood product reduces the amount of ionized calcium in plasma.
Haemosiderosis	Iron accumulates in the tissues as a result of iron overloading during frequent blood transfusion
Haemodilution	Development of blood attenuation due to large amounts of blood products administered (the decrease of the amount of coagulation factors, reduction of platelet number) Hypothermia massive transfusion, administration of blood product of inappropriate temperature (bradycardya, arriythmia)
Hypothermia	Massive transfusion, delivery of blood product of inappropriate temperature (bradycardya, arriythmia)
Blood coagulation disorders	may be caused by hypothermia as well as the mechanisms described/ covered at haemodilution, the utilization of clotting factors
Air embolism	air enters into the vascular bed due to improper venting
Hyperkalaemia	masszív transzfúzió során idős vvs-készítmény transzfúziója, amelyben nagy a szabad kálium mennyiség Massive transfusion in which after blood collection the number of the disintegrating red blood cells increases proportionally with elapsed time cells and consequently the quantity of K. e

gen), and 2 tubes of native blood samples (in a yellow capped gel-separated tube : CN, creatinine, ions, direct / indirect bilirubin), and the urine collection (haemoglobin, Ubg), which are to be sent to the clinical chemistry laboratory.
  - from blood product: sampling for cultivation of blood culture/haemoculture
  - possibly D-dimer (blue cap blood collection tube);
- checking the administrative, identification error (tags, forms, samples of blood, blood product data control, macroscopic control of blood product);
- the repeated completion of clinical blood grouping (patient and blood product)
- re-recording medical history;
- the following tasks should be performed in compliance with the Transfusion Policies and institutional regulations.
  - documentation tasks (report);
  - notification duties (telephone and later in writing - the doctor responsible for transfusion, transfusion department, OVSZ regional institution);
  - if the origin is with the immune system or haemo lytic transfusion reaction is suspected, pre-and post (after the suspension of transfusion) transfusion blood samples should be sent to the transfusion department / institution of the regional OVSZ off the record, and the rest of the blood products administered within 48 hours before the complications.

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23. Nutrition, the Need for Nutrition

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Dietetics

Anatomical and physiological context

Nutrition

Nutrition is the totality of processes during which the living organism ingests, digests, absorbs, conveys, utilizes and secretes nutrients. It is connected to the characteristics of the foods which promote the maintenance of the healthy state. Nutrients are the components of foods which are necessary for growth and life operations. Nutrients can be divided into six groups: water, carbohydrates, lipids, proteins, vitamins, minerals. They have numerous important functions, they provide energy, serve the maintenance of body tissues, take part in the life functions of the body (growth, cell operation, enzyme production and thermoregulation). Essential nutrients are the nutrients which the organism itself cannot synthesize in the quantity required by the physiological need, so they have to be obtained from food.

Metabolism

The totality of physical and chemical reactions in the body cells, which consists of particular processes carried out by specific enzymes and is regulated by hormones, is called metabolism. It consists of two phases. Anabolism includes the synthesis of cell components from nutrients, and results in formation of new, compound materials, and storage of energy. This process is needed for the growth, maintenance and correction of tissues. Catabolism includes the decomposition of compound cell materials, during which energy is released for work, energy is stored or heat is generated. Increased energy consumption leads to the increased quantity of adipose tissues, it increases anabolism. Limited energy consumption induces catabolism.

Energy

Energy is measured in kilocalories (kcal), which is simply called calorie. Carbohydrates produce approximately 16,7 kJ (4,1 kcal) energy per gramme, lipids approximately 39 kJ (9,3 kcal) per gramme, proteins approximately 16,7 kJ (4,1 kcal) per gramme. The energy production of alcohol is about 29 kJ (7 kcal) per gramme (1 kcal = 4,18 kilojoule, that is kJ). There is an energy balance, when the energy taken in from food equals the energy amount that is adequate for the maintenance of the life functions of the body and satisfies the energy need for its physical activity. In case of a positive energy balance the energy intake excedes the energy dissipation, so the body weight increases. A rounded 32 800 kJ (7840 kcal) energy intake, which is not followed by energy dissipation, results in a 1-kg weight increase. If the energy intake is less than the energy dissipation, a negative energy-balance occurs, which results in weight loss. Burning 32 800 kJ (7840 kcal) energy without energy intake leads to a 1-kg weight loss.

Basic functions of nutritional components

Protein is necessary for the growth and maintenance of body tissues, carbohydrates are essential for the operation of the organism and its physical activity. Lipids (fats) are energy sources. Minerals and vitamins take part in the regulation of life processes. Water is essential for the sustainment of life. Fibres help intestine operation. The five basic groups of nutrients all play a significant role in the operation of the organism and health maintenance. The necessary daily quantity for this varies depending on the individual, it is influenced by several factors, e.g. age, sex and lifestyle.

Dietary regulations concerning carbohydrates

There are no specific regulations for carbohydrate intake. About 55% of the daily calorie intake should be carbohydrates. The largest part of it should be in form of compound carbohydrates. The National Cancer Society recommends a daily consumption of 20-30 g of dietary fibres. Carbohydrate is the component of numerous foods, among others it is present in bread, cereals, potato, rice, pasta and cakes, fruit, vegetables, milk and dairy.

Dietary regulations concerning fats

There are no specific regulations for lipid intake. A diet has to incorporate fats, the daily intake should be 30% of the total daily energy intake. In the centre of regulations concerning dietary fats, there are two main points: excessive fat consumption and the limitation of the intake of saturated fat. Foods from animal sources which are rich in fats are lard, butter, beef, mutton, yolk, cheese, sour cream, while from vegetable sources vegetable oils, nuts, and seeds, chocolate, olives, and avocado are rich in fats. Changing over to vegetable oils and fish rich in fats favourably influences the unsaturated–saturated fatty acid ratio in our food.

Dietary regulations concerning proteins

Recommendations for the quantity of proteins to be consumed in the diet depend on age and the approximate body weight. Protein intake should not exceed 15-20% of daily energy intake (0,8-1,0 g/kilogram of body weight). Vegetarians must provide adequate and balanced amino acids from a broader scale of nutrients. The average adult daily protein demand is between 45 (for women) and 53 (for men) grammes from good quality, excellent proteins. This quantity can be found in 160-185 g of lean meat, 180-210 g of hard cheese and 7-8 eggs. Most of us ingest more than this, however, excessive protein intake is unfavourable, as the organism breaks down the excess and uses it as energy. Complete proteins are: milk, lean meat, cottage cheese, eggs, fish, poultry. Incomplete proteins are: beans, peas.

Dietary regulations concerning vitamins

Vitamins are indispensable, but they are really only needed in small quantities. Nowadays more and more people take vitamin supplement products, but this is hardly necessary as vitamins either accumulate in the organism, which might be dangerous, or, depending on the degree of their solubility they are excreted quickly.

A balanced diet, which equally contains nutrients from animal and vegetable sources, ensures continuous and adequate vitamin supply and prevents deficiency diseases. Water soluable vitamins can be found in fresh fruit, citrus fruit, vegetables, grean leafy plants, barm, brown rice, sultanas, nuts, cereal germ, wholemeal cereals, sea food, liver, beef, eggs, fish, haslet, pork, dairy products. Fat soluble vitamins are in: vegetable oils, wholemeal cereals, liver, milk, eggs, dark green leafy, yellow and orange coloured vegetables and fruits.

Dietary regulations and minerals

Minerals only exist in nature, the organism does not produce them. Minerals have two forms: non-metallic elements, which are organic materials, and metallic elements, which are non-organic materials. Minerals build up 60-90% of the total non-organic materials of the body. Minerals buiding up non-organic materials get ingested in adequate quantity during average food intake, but they must be converted into ionic form so that the organism can use them. Calcium takes part in forming components of important organic structurs (bones and teeth), this is why adequate calcium supply is important. If calcium intake is inadequate until early adulthood, later on it will lead to osteoporosis; bone loss is especially pronounced in the period after menopause. Dairy products, green leafy vegetables and tinned fish are all good sources of calcium. They indirectly contibute to the growth of the tissues. They ensure the soundness of the nervous system and the muscles, and help the transmission of essential molecules across the cell membrane. The most frequent sodium source of our foods is salt. Sodium is needed for keeping our water balance and for the regulation of the nervous and muscular operations. The daily need of macroelements (calcium, chlorine, magnesium, phosphorus, potassium, sodium, sulphur) is more than 100 mg. Of microelements, trace elements (chromium, cobalt, copper, fluorine, iodine, iron, magnanese, molybdenum, selenium, zink) less than daily 100 mg have to be consumed.

Functional foods

We have heard of the beneficial effects of sea fish containing omega-3 fatty acids, beef and dairy containing conjugated linoleic acid (CLA), and yoghurts containing probiotics several times. Functional foods are those which prove to be useful in the operation of the organism, that is, on the basis of their content, biological utilization, they provide extra health benefits. Among foods of vegetable origin oats, soya, linseed, tomatoes, garlic, onion, broccoli, citrus fruits, cranberry, tea, wine and grapes can be mentioned.

Enriched foods

Enriched foods are foods, to which vitamins, minerals or other nutritionally important materials have been added during procession, with the objective that their nutritional value, biological value should be increased, whether the certain material is inherently present in the food or not. Enrichment is mostly voluntary, that is, it is the food manufacturer's responsibility that the related product should be safe for the consumer from every aspect. For nutritional reasons in several countries the state prescribes compulsory food enrichment so as to provide adequate nutrient intake.

Additives

The so-called food additives serve to improve the taste and consistency of foods, increase their shelf life and marketability. They are not considered to be nutrients themselves. They are mostly synthetic materials, but more frequently and increasingly natural materials are used. Additives are examined in laboratories in advance, and they are allowed to be used only if they prove to be harmless to health.

Nutritional needs according to age groups

Balanced nutrition of healthy adults

The indispensable part of balanced nutrition is the intake of energy and nutrients in adequate quantity and proportion. Their degree is determined by the metabolic rate, physical activity, age, temperature of the environment, climate, health status, etc. Healthy nutrition provides the organism with sufficient energy, as much as needed. The recommendations of the WHO are taken as a basis, which say that with regard to the daily diet the protein intake should be 12-15 Energy%, the carbohydrate intake should be 55-58 E %, and the fat intake, 30 E%. The energy is always individually defined, based on the metabolism. For obese or abnormally thin individuals the amount of energy should be calculated for the ideal body mass with the help of the BMI. Obesity, low fibre nutrition, excess salt intake, lack of ecxercise should also be considered. From the age of 30- 35, the performance and life functions fall back, metabolism decreases. First this is slow, but then by 10 % every 10 years, later by 5 %, finally in old age to an even smaller degree. High energy density foods (foods rich in energy), alcoholic drinks should be avoided, and weight gain should be prevented. Another important tool for preserving body mass is proper exercise. It is especially important if somebody does a sedentary job, or a job that involves little physical activity. Even a grown-up should have five meals a day. Smaller meals should not be energy bombs or snacks, but fresh fruit, fruit juices, salads, vegetables, dairy, etc. A healthy person's stress tolerance is much better, his ability to solve problems also works more effectively.

Infant nutrition

Infant nutrition must ensure the optimal development, growth of the baby, and its maximal disease resistance. The baby's energy demand in the first six months is a daily 115Kcal/bmkg, then by the age of 12 months it gradually falls back to 95Kcal/bmkg. As to protein, the needed intake is 2,2 g/bmkg, by the end of infancy it has to be reduced to 1,9 g/bmkg. The carbohydrate intake should be 11-13g/bmkg. The need for fat is 4-5g/bmkg. Fluid should be 120-150ml/bmkg. The ideal nourishment for an infant is their mother's milk. The newborn must be breastfed within an hour of their birth. The quantity of beestings (colostrum) produced in the first days is very little, but it contains a lot of protein, immunoglobulin, and minerals, and it has a great role in forming the newborn's intestinal flora. To replace completely or partially missing breast-milk, a healthy, 0-6–month-old infant should be given infant formula (replacement).

From the age of 6 months breast-milk complementary formulas can be applied. After 9 months baby milk is recommended. Cow's milk or diluted milk cannot be given under 1 year of age. At separation the introduction of solid foods is not recommended before the age of 4-6 months, or later than 9 months. At this time the infant gets to know the pressed juice of fruits and vegetables, then fruit pulp, later on vegetable purees can be introduced. To thicken food, potatoes can be used. Food that contains gluten is not to be given under 6 months of age. Boiled egg yolk from 9 months, egg white can be given after 1 year of age. Besides the separation routine it is correct to continue breast-feeding until the end of infancy. If breast-milk is completely missing, to replace it, an infant under the age of 4-6 months should be given infant formula (breast-milk replacement), after 4-6 months of age the so-called separation formula (follow-on formula) which suits the needs of an older infant, is adequate (breast-milk follower). (Medical formulas – protein isolates; soya formulas– galactose free.) With regard to their composition and biological value, infant formulas are close equivalents to breast-milk.

Nutrition of the 1–3-year-old child

Development and growth are the most intensive in infancy. The baby triples or quadruples its body weight at birth by the time he is 1 year old, the weight of the brain increases to the double. This is why energy and nutritional demand is obviously great. As the pace of the growth of the infant gets slower, his interest towards meals lessens, he directs his attention towards the exploration of the environment. This is the exploration phase of foods, too. It is a physiological trait that his taste changes day by day. He will not eat tomorrow the things he likes today, for days he might just accept one kind of food. The quantity consumed can be greater at times, unsignificant at others. At this period it is necessary to form his right eating habits and correct eating methods which will apply to all his later life. The child must be taught how to use the glass, the cup, the cutlery and the serviettes independently. The pace of the child's growth slows, at the same time his appetite lessens. The eagerness to take food is also reduced by the appearance of the teeth. Their energy demand is between 1100-1300Kcal, protein need 10-15 E% (energy per cent), carbohydrates 50-55 E%, fat need 35-30 E%. Necessary fluid 100-120ml/bmkg. The energy and essential nutrition for their development, and great need for movement has to be secured. They should be offered a wide range of foods, as it is at this age that their lifelong eating habits will be formed.

Nutrition of the 4–14-year old child

The child learns the right food choices, food preferences and taste are formed. Eating patterns, the right way of eating, a safe, hygienic, civilized level of eating, a lifelong eating behaviour all get ingrained in childhood. By the time the child goes to kindergarten, his way of eating gets more adept, he takes an active part in family life. A meal is not only about nourishment now, it is also a social event. Some of the meals have to be managed outside the home. This time period can be characterised by a great deal of mental development and socializing. The optimal intake of adequate energy and some essential nourishment is necessary for the child's growth. The child's energy demand is calculated on the basis of the number of their years, or from the metabolism, by applying the right multiplier. The nutritional need is influenced by the child's age, sex, nutritional status and physical activity.

Nutrition of the pregnant and breast-feeding mother

The healthy pregnant mother gains 10-12 kg of body mass if her nourishment is adequate. The degree of the suggested weight gain is influenced by the mother's body mass before conception. Generally, it is advisable to raise the daily energy intake by 300 Kcal. The pregnant mother's protein need increases by 6-10 g daily, the carbohydrate need by 25-30 g and she needs 1-2 g more fat.

Besides eating foods rich in folic acid, in the first trimester supplementation is also necessary to prevent neural tube closure defects. The amount of calcium to be ingested also increases. Zink deficiency can cause damage to the foetus, premature birth and obstetric complications. We have to count on increased amounts of vitamins, too (thiamin, riboflavin, niacin, pyridoxine). Newborns of smoking mothers have lower weight at birth than those of non-smokers. Nicotine has a vasoconstrictive effect, it lowers placental blood flow and this may cause foetal hypoxia.

Smoking raises the need for zink, folic acid, vitamins B_{12} and C. Alcoholism during pregnancy leads to foetal alcoholic syndrome (mental retardation, somatic growth retardation, malformations). Excessive coffee consumption is not recommended (nor is strong tea). Nearly 50 % of pregnant women have constipation. By increasing the consumption of dietary fibres (vegetables, fruit, brown bread) constipation should be managed. Frequent, small meals are advisable, foods that cause bloating should be avoided, this way the further pushing up the aperture can also be avoided. Certain foods (fruit, sweets, etc.) can be desired by the pregnant mother, while others (which she used to like) are rejected. Consumption of preferred foods should not lead to one-sided nutrition. The breast-feeding mother's diet does not affect the most important components (protein, milk sugar, fat, Ca) of the mother's milk directly, if the mother's nourishment is poor, nutrients are distracted from her own organism. But the fatty acid, vitamin A, vitamin B2, biotin, vitamin B12, folic acid and vitamin C content of breast milk is influenced by the breast-feeding mother's diet, and if the intake is defective, the amount of these nutrients significantly decreases in the mother's milk. Under certain circumstances, the zink, fluoride, iron and viamin D content of the breast milk is not independent from the mother's nourishment either. In case of adequate milk production, the mother produces an average daily 850 ml of milk. She has to consume this much more fluid and 25-30% more of her original energy demand (600-700kcal/2920-2940kJ).

Nourishment of the elderly

We have more and more opportunities to keep our body healthy. We can significantly lengthen our life expectancy by a healthy lifestyle, including a balanced diet and regular exercise. Food should be nutrient dense, as the elderly consume a smaller quantity. The difficulty in chewing meat due to a deterioration of dentition can lead to protein deficiency, scarcity in material wealth and limited mobility lead to one-sided nutrition. Foods rich in carbohydrates can be easily digested, they contain enough fibre, which stimulates the slowed down intestinal movement, thus constipation can be prevented (brown, semi brown, rye, different types of bread, baker's ware, durum pasta, raw vegetables, vegetable dishes, fruit). Plenty of vitamins and minerals should be ingested, more calcium is needed, vitamin D is also essential, iron intake should be solved by consuming a proper amount of meat.

Unified Dietary System

When compiling a dietary system, we must consider that whatever kind of diet it may be, it is some variation of the basic diet of the medical institution. Individual diets can be derived from the basic diet. The volume ratio of certain nutrients can be altered, also somewhat more or less can be added of some of the nutrients (e.g. high protein – low protein, high energy – low energy, etc.). Provision for the altered nutrient demand can be achieved by proper selection of raw materials, and the compilation of a new diet from these. Besides the selection of the proper raw materials, we have to apply adequate kitchen technology processes as they are important in achieving the dietary effect. Starting out from this, the unified dietary system has two main groups. One of the groups is the variation based on content (energy and nutrient content), the other is the variation based on the way of preparation (consistency). With these two groups, the diet of 85-90% of hospital inpatients can be defined. The rest can be divided into four further groups.

- It can differ according to nutrient content: basic diet of the medical institution, energy/ protein rich diet, low energy diet, low protein diet, low fat diet, diabetic diet, low sodium diet.

- Variant according to the method of preparation: liquid, pulpy, low fibre, light - mixed, normal, rich in dietary fibre variant.
- Artificial nutrition: parenteral nutrition, probe feeding.
- Special diets: raw diet, acidic-alcaline diet, sugar and milk free diet, low purin diet, gliadin free diet, low cholesterol diet, phenylketonuria diet, lactose intolerance diet, reform diets.
- Diagnostic diets: search diet, diet preparing colonoscopy, etc.
- Dietary complementation of medication.

Diagnostic diets

The aim of a diagnostic diet is the dietary confirmation of different examinations, they are to be eaten 1–3 days before the examination. When giving diets with diagnostic purpose, care must be taken lest the diet should cause any harm.

Dietary therapy in the treatment of patients /dietary suggestions for certain diseases

Esophageal lesions (Reflux disorder)

Liquid, pulpy diet is recommended, the basis of which can be soups, soft boiled eggs, milk drinks, fish boiled soft, pastas, puddings, soft cheeses, cheese dishes. Very salty, spicy, rough fibred, extreme temperature foods, and sour juices that irritate the mucosal (lemon, orange, grapefruit, tomato juices) have to be omitted from the diet. Besides taking the former into consideration, it is advisable to build up the daily diet from several, small meals to prevent abundant gastric acid secretion due to stomach expansion and hearty meals. It is not advisable to have a meal while lying or being in a stooping posture. Tight belts, waist belts and tight clothes are not advantageous, smoking is definitely harmful.

Gastric and duodenal ulcer

The aim of the diet is to reduce and neutralize gastric acid secretion, maintain the acid resistance of the gastric and intestinal mucosal, eliminate the patient's complaints, restore good nutritional status. Numerous nutrition factors influence gastric acid secretion.

In the cephalic phase the thought of different foods, their taste, smell, chewing and swallowing increase the acidity of the stomach by triggering acid secretion due to their effects induced through the vagus nerve on the parietal cells of the gastric fundus mucosal.

In the gastric phase the dilatation, tension of the fundus increases gastric acid production, the buffer effect of the food causes a decrease in acidity and this stimulates gastrin secretion in the pyloric antrum, thus starting acid production again. Numerous foods and components, materials emerging in the course of digestion raise acidity, such as coffee, caffeine, alcohol, milk, products of protein digestion, some amino acids.

Acute diarrhoea

Diarrhoea is not an illness, it is a symptom. Acute diarrhoea ususally comes about due to an infection, the effect of medication or food intolerance. Dietary treatment contains restoration of fluid and electrolyte status, and the symptomatic treatment of diarrhoea. The recommended form of oral liquid intake to replace liquid and electrolyte for grown-ups in light cases is fruit juices. In more serious cases oral rehydrating liquid should be applied, parenteral liquid and electrolyte replacement is necessary as well. To influence diarrhoea, first of all sources of pectin (apple) can be considered. After the symptoms are alleviated, the quantity of food can be gradually raised. During the diet, food containing small seeds, popcorn and legumes are better avoided. Among fruit, plums, greengage, the diffent kinds of melon can cause symptoms. As the temporary decline in the activity of the lactase enzyme often occurs together with acute diarrhoea, it is advisable to omit food containing milk or milk sugar from the diet for a short period of time.

Acute gastritis

The aim of the treatment is to provide a rest, relieve the stomach for the time of the recovery. Starvation is necessary for one or to days, then liquids and liquid food can be introduced. The juice of cooked vegetables are good sources of potassium, they can even be salted. First only some spoonfuls can be offered, then if the patient is not nauseated, he can drink the following from a cup: juice of cooked vegetables, strained juice of potatoes, tea brewed dark, fruit tea, linden tea, rose hip tea, still mineral water. On the next days, food rich in pectin should be taken into the organism, as it distends, it coats the inflamed walls of the intestine and protects them from harmful materials, too (apple grated on a glass grater). In the next 1-2 days we can extend the range of foods, bud added fat still should not be used. We should apply cooking, steam cooking or kitchen technologies low in fat. Materials causing increased intestinal movements (intestinal peristalsis) should be omitted from the diet, such are seeds, walnuts, hazelnuts, almonds, popcorn and cooked corn, legumes, brassica vegetables. Consumption of thick sugar solutions, jam and juices are not recommended as they increase diarrhoea. Foods irritating the intestinal mucosal should be avoided: hot spices (chili, peppers) greasy, smoked meat, pepper, cucumber, radish. As diarrhoea often goes together with the temporary decline in the activity of the lactase enzyme, that is, the organism is not able to break down milk sugar, it is advisable to omit food containing milk or milk sugar from the diet for a short period of time. After the symptoms are gone, we can gradually return to the regular diet.

Crohn's disease, Colitis ulcerosa

The aim of dietary treatment is to stop the emerging lack of energy and nourishment, restore the nutritional status, cease malabsorption. Usually a high energy content diet is needed (40-50Kcal/bmkg) in the recovery state of malnutrition. Af-

ter reaching the desired nutritional condition, increased energy intake is only advisable in case of complications which highten energy demand. Introduction of several light meals is advantageous. Application of MCT (explain abbreviation) fats may be necessary. In the acute phase a definite limitation of dietary fibre intake is needed. In the recovery phase the diet is energy and protein rich, low on fat and free from rough fibres. As a great number of the patients are undernourished, thin, and they often have a vitamin deficiency, they should be given vitamin and mineral rich food, which is free from hot spices. It is essential to replace the minerals and liquid lost due to diarrhoea, so it is recommended to give the patient water, (still) mineral water, lemonade, tea brewed light, cornel tea, green tea, chamomile tea as a liquid replacement. Among breads, toasted white bread, Hamlett, Abonett (kinds of extruded, puffed cereal cakes in Hungary), second-day white bread, rolls (baker's ware) can be offered. Juices of cooked vegetables, vegetable juices, ptisan soups are also advantageous in the diet.

Acute pancreatitis

On the first day of the diet, the patient must be starved and thirsted, and given a replacement of parenteral liquid and electrolyte. Oral nutrition can be started after 24-48 hours, usually by giving liquids, depending on the tolerance of the patient. In serious cases longer parenteral nutrition is recommended. (More details in the chapter on artificial nutrition.) In the case of a lighter improvement, the diet should be low fat and easily digestible; fats, fatty acids, amino acids, which do not stimulate the secretion of pancreatic juice, should be given. Later on an alcohol free, balanced diet is recommended.

Chronic pancreatitis

The aim of the dietary treatment is to slow the progression of the exocrine or the endocrine malfunction. The utmost characteristic of the diet is low fat. It is worth starting out with 50g/day or an even smaller quantity, and the tolerated quantity can be defined through a gradual, moderate increase. By incorporating MCT fats, further improvement can be achieved. If insulin deficiency appears, it is necessary to introduce a dietary treatment used at diabetes.

Chronic renal insufficiency

The diet is about sparing the kidneys, maintaining a good nourishment status (energy, protein, vitamin and mineral intake) by reducing the load of urea, uric acid, creatinine, potassium, sodium, and phosphate to be secreted. Furthermore, the prevention of oedema and the appearance of renal distrophia, by regulating the calcium, phosphate and vitamin D intake, minimization of the risk of glucose intolerance, providing a palatable diet in the predialysis period. It is important to establish the quantity of the individual nutrient components of the diet (protein, carbohydrate, mineral salts) according to the values measured in the blood serum. Liquid balance depends on the quantity of the urine output (voided volume + 500ml/day). Due to chronic renal insufficiency renal functions deteriorate to such a degree that life can only be sustained by artificially removing toxic materials and superfluous fluids. Dialysis is the artificial replacement of the renal function. It does not replace the inner functions of the kidneys, nor is the removal of waste products of complete value, so it is necessary to keep the diet and take the special medication even besides the treatment.

High blood pressure (hypertonia)

High blood pressure disease (hypertension) occurs if blood pressure is permanently above 140/90 mmHg. The higher the blood pressure, the closer the connection between early death and the frequency of arteriosclerosis. Components of lifstyle change: Overweight-obesity: the optimal target value of weight reduction for patients with high risk is BMI<25 kg/m^2, waist circumference 94 cm (for men), 80 cm (for women). The diet should be low in energy, fat and high glycemic index carbohydrates, it should contain 500 kcal less energy than the energy demand. (More details at the topic 'obesity, low energy diet'.) Healthy diet: consuming vegetables, fruit, wholemeal cereals, low fat dairy products, fish and lean meats should be preferred. Excessive consumption of saturated fats should be reduced, replaced partly with monounsaturated and polyunsaturated fatty acids, omega-3 fatty acids, partly with complete carbohydrates. Salt consumption is to be reduced, the target value is <6 g NaCl / day. Calcium, potassium and magnesium intake is to be raised.

Obesity

Obesity is the imbalance of the dietary intake and the energy output, together with excessive energy storage. Obesity health risk factors in the field of different diseases are numerous. It can be a precursor of cardiovascular diseases, tumors, endocrine and metabolic diseases. On basis of BMI (Body Mass Index), we talk about obesity in case of values over 25, from slight to really serious obesity. The diet should be conducted only by a professional. Calories under the energy value of the metabolism are not usually given. Five meals a day are important, the diet should basically be low fat, low sugar, and low calorie. In case of an adequate diet, the normal pace of weight loss in the first two months is 4-5 kg/month. The objective is slow weight reduction, approaching and maintaining the ideal body mass. It is important to have helping environment, spiritual support, motivation, a sense of success. It is essential to check the body mass regularly and to introduce an exercise programme. The diet should accomodate to the patient's daily activities and work schedule.

Body mass index (BMI)

The notion of body mass index was developed in the middle of the 19th century by a Belgian statistician, Adolphe Quetelet, to measure fatness. BMI found its way into health care together with one of the basic phenomena of the western world, obesity. Its significance appears in other areas as well, e.g. it is the basic measurement of the problem in case of body image confusion therapies. Calculation of BMI is simple: body weight measured in kilograms should be divided by the square of the height measured in metres (BMI =BM(kg)/BH^2(m).

Osteoporosis

Numerous risk factors influence its develpoment (lack of movement, physique, inherited qualities, oestrogen deficiency, diseases, medications, smoking, alcohol consumption, etc.) Its prevention starts already during pregnancy, the aim is to provide the mother with calcium, magnesium, vitamin D, manganese and copper. In childhood and adolescence the objective is the same, also to reach the maximum bone mass, facilitation of mineralization of the bones while the person is young, by exercise and adequate nutrition. Theoretical bases for the treatment of osteoporosis: primary prevention: as we do not have a treatment method by which lost bones could be replaced, only progression can be stopped, this is why prevention is the main goal. The objective is to achieve the highest possible bone mass in childhood and adolescence. The role of prevention is justified by the fact that it is easier to maintain bone health than to cure the disease once it has appeared. Sufficient quantities of protein, Ca, vitamin D, vitamin C should be supplied. The average need for grown-ups is 800 – 1000 mg of Ca, in osteoporosis 1200 – 1500 mg. A developing organism needs 1200 mg, in menopause 1500 mg, in pregnancy, during breastfeeding and in old age 1500 mg. Secondary prevention: prevention of the development of osteoporosis by proper nutrition and exercise. Tertiary prevention: the already developed disease should be slowed down. In diets it is hard to separate prevention from treatment. In both cases it is characterized by balanced nutrition which accomodates to the energy and nutrient need of the age group, putting an emphasis on proper Ca provision. In the osteoporosis diet, providing adequate quantity of Ca has priority, the quantity varies between 1200 – 1500 mg per day.

Nourishment of patients with diabetes mellitus

Diabetes is a complex metabolic disorder, as the disorder of carbohydrate metabolism goes together with the disorder of protein and fat metabolism, too. The essence of diabetes is: the relative or absolute lack of insulin, one of the essential hormones of the pancreas, or the decrease or the failure of the insulin effect. Cells cannot take sugar, it remains in the blood and raises its sugar level. The aim of the diet is to achieve and maintain the optimal body mass and nutritional status, keep plasma glucose in the range which is the closest to normal, prevent or delay the development of complications, win the cooperation of the patient, so that he keeps the diet.

Medication – nutrition interaction

By interaction we traditionally mean only the interactions developing between the medicines given at the same time, but in certain cases an interaction may develop between medications and food. It means that the quantitative and qualitative composition of food can influence the effect of the medicines, at the same time certain medicines can significantly influence the utilization of nutrients. The effect of medicines can be modified by different factors: age, hormones, genetic factors, certain illnesses (kidney and liver disorder, high temperature), but beyond these, prolonged quantitative starvation and the malnutrition developing as a consequence, is also an influential factor, because in these cases the function of the enzymes metabolising the medicines decline.

Interaction can develop as a direct effect in the gastro-intestinal tract, due to the effect on the enzymes metabolizing the medicines, and to the change in the effect of the medicines.

Nutrition support, Problems influencing nutrition

Appetite

Good appetite can be considered as a sign of health. It is seen that one of the very first effects of illnesses is impaired appetite, it either lessens or disappears. The situation is further worsened if the patient gets out of his home, his usual environment and eating rhythm. The negative effect of the hospital environment on the patient's appetite can be reduced by the nurses if they follow the right practice in nutrition support. Many factors can influence the patient's appetite in hospital, for example the environment itself, nausea, discomfort, pain, bad tastes in the mouth, unpleasant odours, stress, eating habits, social or family background, etc.

Eating, meals

Good quality nutrition, meals provided for the patient under appropriate circumstances is the essential part of healing. It is the nutritionist's task to plan the individual diet for the patient based on the doctor's suggestions, and taking the underlying illness into consideration. Through her work she can keep track of the patient's nutritional state, nutrition, nutritional habits, and informs both the doctor and the nurse. It is an essential requirement in hospital departments to establish a dining room, a kitchenette, where pa-

tients can have their meals under civilized circumstances. These rooms are formed so that both walking patients and the ones in wheelchairs can access it easily. Nowadays for serving the individual, a central tray system is used. Dosaging and placing the food onto plates for the patients is done in the kitchen of the hospital, where the food is sorted out individually, in accordance with the patient's diet. It is taken to the departments in closed carts, suitable for food delivery. The patient receives food on a tray on a preheated plate. Identification tags are attached to all the trays, which makes delivery easier for the nurse. Care must be taken so that the food is served at the right temperature. Hospital practice is that there are three or four meals, but certain diseases might influence the frequency of meals. We should aim at set serving times for the meals, also patients should have enough time to have them. The nurse must make sure that serving improves the appetite and is aesthetic, the table or the bed table is laid nicely. Care should be taken to the cleanliness and neatness of inpatients' beds (Nosza 2000).

Nutritional ability support

During our first meeting with the patient, when his needs are assessed, we must consider not only his eating habits and the factors influencing nutrition, but also the patient's self-sufficiency, that is, how well he can satisfy his own nutritional needs. We must be informed with what and to what extent the patient needs the nurse's help. Based on this different categories can be distinguished, which have great significance in organizing nursing work. At the hospital most of the patients are completely *self-sufficient, they do not need any help during the meals,* they can go to the diner, or dining room on their own, they can eat alone, the only important thing is the exact delivery of their individual diet. Some others need slight *support, caring while satisfying their nutritional needs.* It is important for patients who are hindered in their movement or senses to be accompanied when they walk or are taken to the diner, the dining room in their wheelchairs, where they themselves can have the meals served for them. In case of certain diseases some of the patients cannot leave the ward, but they can eat by the table laid there. For them, mainly the service, presentation of food and provision of the proper circumstances can mean help. Patients who cannot get out of bed for a reason, e.g. weakness, unilateral paralysis, condition after operation, fracture, but still can have their meals on their own, *need increased help* when their food is served. In this case serving for the patient has to be done on the bed table placed on the bed. If necessary, the food must be cut up, placed on the plate, the cutlery, serviette, and the drink put near the patient's hand so that he can reach them. The patients who need the nurse's complete care belong to the fourth category. For *weakened patients in serious conditions,* not only serving, creation of the right position for eating or creation of the circumstances necessary for a civilized meal are important, but also feeding them, if they can take neither the food nor the drink to their mouths on their own. Such patients can chew slowly and swallow the food put into their mouth, so a calm environment and the proper time devoted to eating is vital. The head of the patients who may be immobile due to paralysis, mentaldisability, concussion of the brain, etc., but who are able to swallow, should be gently raised and the nurse should facilitate food intake with the help of a beakered cup. If there are any patiens who have a problem with their swallowing function or are unable to ingest through their mouths, or due to their illness it is not allowed for them to eat, their nourishment has to be solved enterally or parenterally. (P. Varga, 1998)

Oral nutrition of patients in need

Before feeding patients in need we have to assess their state of mind, mobility, cooperational ability, physical limitations, level of nutritional needs, presence and usability of aids used for eating (denture) and excretion needs. Special care must be taken to establishing the circumstances for civilized meals, the cleanliness of the nurse's clothes and hands, preparation and cleanliness of the equipment needed for feeding, identification of the patient, taking the right posture for eating, checking the diet before being served, using kind and supportive communication, providing enough time and satisfying the patient's hygienic needs. During the caring task the patient's condition has to be perceived continuously (pain, hiccup, retch, etc.) the patient's reactions have to be monitored, (mimics, opposition, verbal message, etc.). The patient's safety has to be observed (slow chewing, while he is swallowing the pace of giving food has to be slowed down, too). The nurse has to follow the patient's observed eating pace so that the patient can take the amount of nourishment required. After finishing eating (feeding) care must be taken so that the patient can satisfy his hygienic needs (oral care, denture cleaning, washing hands, etc.), his cutlery and environment should be tidied, he must be placed into a comfortable posture. Following this the quantity of food and drink consumed by the patient has to be documented, and if it occurs, the reason of food refusal.

Problems influencing nutrition

Gastrointestinal functional disorders are accompanied by various complaints and symptoms. Symptoms indicating the disorders of the stomach can be loss of appetite, giddiness, nausea, vomiting, dyspepsia, diarrhoea, constipation, regurgitation, dysphagia, globus sensation, abdominal pain, chest or back pain, gastrointestinal gas gauge, weight loss, meat disgust, satiety, bloating, early satiety (Varró 1998; Tullassay 2007).

Relieving the stomach

Due to some gastrointestinal disorders (bleeding, infection, tumor, stenosis, acute stress, small intestine ileus) emptying of the stomach or intestines will be hindered. The primary aim of the treatment is relieving or emptying the stomach.

NG tube insertion

Nasogastric tube is a tube inserted through the nasal cavity, esophagus to the stomach, which can be used for *feeding* (patients in coma or in semicomatic state, or if the patient is not able to take food orally), *decompression* of the stomach (after gastrointestinal surgery, emptying gastric contents, etc.), but it can also be used for a *stomach flushing* (gastrointestinal bleeding, for hoemostasis) or in case of different poisonings for doing a *gastric lavage.*

During the application of the nursing process very important aspects are the patient's preparation (anamnesis, status assessment, physical examination) giving information about the intervention, winning the patient's cooperation. Before each intervention with the probe, the patient has to be informed about the aim, the process, the period of time, the occurring inconveniences, reactions, complications (diarrhoea, dry mouth, irritation of the nose area) and the things to be done after the intervention.

We must get information about the *underlying disease* (disease associated with bleeding disorder, esophageal varices, diverticulum, sinusitis, difficult swallowing, nasal bleeding, septal deviation), recent *operations* (abdominal surgery, nose surgery, head and neck surgery), the patient's habits concerning *taking medications, sensitivity to medications,* medications taken earlier. Before the tube is inserted, removed and before a rinse, the patient's abdomen has to be examined in each case, if his stomach is swollen, if he has a pain or nausea. Before each intervention the vital parametres have to be checked and recorded (blood pressure, pulse, breathing). One of the most important steps of inserting the tube is the precise compilation of the equipment. The two most commonly used probes are the single-lumen Levin probe and the two-lumen Salem SUMP tube. In some clinics and hospital departments before the use of the tube nasal anaesthesia is used, which is reported in some of the current researches.

The process of nasogastric tube insertion

Place the patient into the right position. Walking, cooperating patients should be seated on a chair, a conscious lying patient should be placed in a high Fowler position (45-60°), an intubated, unconscious or disturbed patient should be placed lying on his side. If his dominant hand is the right hand, you must stand on his right, if he is left-handed, stand on his left to insert the tube. Place a hygroscopic mat/towel on the patient's chest and a towel at his hand within his reach. Check the interoperability of his nose. Measure the length of the tube, the distance from the patient's nose tip through the lower lobe peak to the xiphoid process (processus xiphoideus) of the sternum. Mark this distance on the tube with an adhesive tape or alcoholic marker. If the patient has a denture, it must be removed. Wet the end of the tube, about 7.6 cm long, (use local anaesthetic if necessary) attach the secretion bag to the distal end of the tube. Let the patient know that you start inserting the tube. Ask him to relax and breathe calmly. Ask him to lean his head backward slightly, keep his neck straight and look forward. Drive in the tube through the chosen nose passage to the back of the pharynx carefully, with a light pressure. Push the tube backward slowly to the direction of the ears. When the tube goes through the naso-pharyngeal cavity, ask the patient to lean his head forward and swallow. Each time the patient swallows, push the tube a little further. During tube insertion the patient should breathe through his mouth and swallow. Driving down the tube must never be forced, if it is stuck, pull it back, and meanwhile the patient swallows, try to drive it down again. If it meets an obstacle, try to rotate it slightly. If the obstacle still does not let it go, pull it back a little, assure the patient he can have a rest, so he can relax his tense muscles before you start inserting it again. If the tube is completely stuck, pull it back and try driving it down through the other nasal passage. If the tubee gets coiled up in the pharynx or the patient starts coughing, choking, stop forwarding it and pull it back. If the mark on the probe reaches the nostril, stop driving it and *check its position.* Ask the patient to open his mouth so that you can see the tube. Using a torch and a spatula check if the probe is coiled up in the mouth cavity or if it is not in the tracheobronchial system. For fixing the tube, if the patient's skin is greasy, wipe the nose ridge with an alcoholic wipe and let it dry. If the tube is in the right place, fix it by splitting a 5 cm long piece of hypoallergenic adhesive tape lengthwise leaving 2,5 cm untouched. Stick the latter on the nose ridge.

Coil one stripe of the adhesive around the tube first, then the other. You can stabilize the tube with "Opsite" or another prepackaged product. The most expedient way to check the exact place of the probe is by a chest X-ray. Ask the patient ot rinse his mouth, if it is necesary, do the mouth rinse yourself. Wash the probe at the nostril if it is contami-

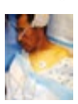
nated. Take off the rubber gloves, put things in order and do a hygienic hand wash (Altman 2009, Lippincott W &Wilkins 2007, Smith-Temple et al 1997). After the nursing intervention put down the information on probe insertion on the nursing sheet.

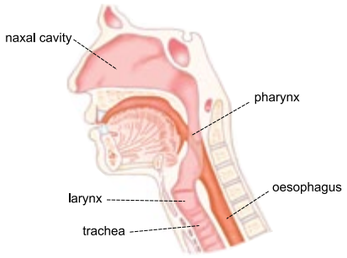
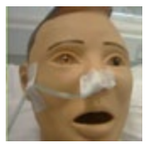
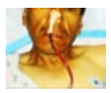
Conducting nasogastric tube protocol

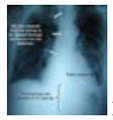
Equipment to be prepared:

- disposable non-sterile rubber gloves
- kidney dish
- bed protection
- lavage liquid (usually physiological salt solution)
- lavage tank
- 60 ml catheter-tipped syringe
- toothbrush, toothpaste
- lemon-glycerine tampon, sponge-tipped tampon
- vaseline
- hypoallergenic adhesive
- lubricant
- stethoscope

Table 1 Process of tube insertion

	Steps	Explanation
1.	Do a hygienic hand disinfection.	To keep the rules of asepsis-antisepsis.
2.	Identify the patient, inform him about the necessity and process of the intervention.	This way the patient's fears can be reduced, his proper cooperation secured.
3.	Prepare the necessary equipment and the room for the intervention.	
4.	Do a hygienic hand disinfection and put on the rubber gloves.	To prevent nosocomial infections and cross infections, and to protect the carer.
5.	Place the patient into the right position:  Illustration 1	High Fowler position makes it easier to insert the probe into the esophagus.
6.	To ensure easy tube insertion, stand on the right of the patient, if he is right-handed and on the left, if he is left-handed.	 Illustration 2
7.	Place a hygroscopic mat/towel on the patient's chest, and a wipe within his reach.	
8.	Check interoperability of the nose:  Illustration 3	 Illustration 4
9.	Clean the nasal passage.	
10.	Check the pharyngeal reflex function.	Make sure the patient can swallow, this way the danger of aspiration can be reduced.
11.	Measure the length of the tube to be inserted.   Illustrations 5-6	With this method the length between the nose and the stomach can be estimated.  Illustration 7

12.	Cut an approximately 8 cm adhesive tape. Split it lengthwise up to its middle so you get a Y shape.	
13.	If the patient has a denture, remove it.	
14.	Wet the end of the tube about 7.6 cm, (perhaps using local anaesthetic) attach the secretion bag to the distal end of the probe.	A lubricated tube reduces friction while it is inserted.  Illustration 8
15.	Tell the patient that you are starting the intervention. Ask him to relax and breathe slowly. Ask him to lean his head a little backward, keep his neck straight, look straight forward.	If the patient breathes normally and is relaxed, it is easier to drive the tube down.
16.	Insert the tube carefully, applying slight pressure, through the chosen nasal passage to the back of the pharynx.  Illustration 9	The progress of the tube is helped by anatomical formulas. Illustration 10 
17.	When the tube gets through the nasal-pharyngeal cavity, ask the patient to lean his head forward and swallow. Whenever the patient swallows, push the probe a litte further. Meanwile rotate it at a 180° angle. If the patient signals, stop forwarding the tube. If you think it is necessary, offer him a sip of water.	During the intervention the larynx closes (the danger of the probe getting into the trachea reduces) and the esophagus opens. This helps forwarding the tube. Breathing through the mouth and swallowing help the probe get into the stomach.  Illustration 11
18.	Never force the insertion of the tube. If it is stuck, pull it back, and while the patient is swallowing, try driving it down again. If the tube is slightly obstructed, try rotating it gently. If there is still resistance, lubricate the tube again and try it through the other nasal passage.	
19.	If the tube gets coiled in the pharynx, or the patient starts to cough or choke, stop forwarding it and pull it back.	
20.	If the mark on the tube reaches the nostril, stop sending it down and check its position.	
21.	You can stabilize the tube with "Opsite" or a prepackaged product.  Illustration 14 Fix the end of the tube to the patient's clothes with a rubber band or a safety pin.	 Illustration 12  Illustration 13

22.	Check the position of the tube with a chest X-ray.  Illustration 16	Make sure the tube has reached the desired destination (stomach, duodenal).  Illustration 15
23.	Perform an oral rinse. Clean the tube at the nostrils.	Secure the patient's sense of comfort and the maintenance of the soundess of the mucosal in the mouth.
24.	Tidy the patient's environment.	
25.	Handle the emerging waste selectively.	
26.	Do a hygienic hand wash.	
27.	Document the intervention: the time (day, hour), fix the name and title of the people doing the intervention, vital parametres (before, during and after the intervention), changes in the patient's condition during and after the intervention. If you notice injury or damage to the skin, report it to the doctor.	

Gastric lavage

A gastric lavage is performed in order to empty the complete gastric contents quickly, and to prevent further absorption of any harmful materials.

Indications for a gastric lavage can be acute poisoning (alkyl phosphate, serious barbiturate, cyan salts, e.g. anti-algae agent for aquariums, ethylene glycol, death cap, mercury salts, lidocaine methyl alcohol, nicotine, carbon tetrachloride, solvent poisoning), drug overdose, removal of stagnant food remains in the stomach, removal of blood from the gastrointestinal tract formed in a gastrointestinal bleeding and controlling the bleeding. In case of hyperthermia it can be used for cooling (Bordás 2006, Babak Mokhlesi et al 2003).

Among the contraindications of gastric lavage, an absolute contraindication is corrodent poisoning (acid, alkali). As relative contraindications, we can mention oesophagus varix or stenosis, respiratory or vasomotor paralysis, aorta aneurysma, generalised convulsion, oesophagus tumor or diverticulum, gastrointestinal bleeding, penetrating ulcer, laryngeal oedema, pulmonary oedema, laryngospasmus, oesophageal stenosis, pulmonary dysfunction. In each case the advantage and disadvantage of the intervention must be carefully considered. On basis of experimental and clinical studies the procedure is not carried out as a routine, only in justified cases (American Academy of Clinical Toxicology 2004).

Two of the most common complications of the intervention are aspirational pneumonia (Merigian et al1990; Liisanantti et al 2003) and perforation of the oesophagus (Caravati 2001; Padmanabhan 1991; Askenasi et al 1984). Other complications can be laryngospasum (Allan 1961) hypoxia, hypercapnia, abnormal heart rhythm (Thompson et al 1987), fluid and electrolyte imbalance, nose bleeding (epistaxis), hyponatraemia, hypochloremia, water poisoning or mechanical injury in the stomach. During lavage mistakes can occur, like injuries due to non-removal of the denture, forgotten lubrication of the tube, tube inserted too low or into the respiratory passages, lavage administered with inadequate quantity of water and/or not adequate temperature water, not giving laxative and charcoal, this is why the personnel doing the intervention must have proper experience and routine.

The first step of the nursing process is to survey the indication, contraindication of the lavage and the patient's state of mind. We must get information about the reason and motives of the potential poisoning. It is quite common that a great amount of alcohol is also consumed with the poison, and as a consequence the patient might get very aggressive. This is why the team doing the intervention has to be prepared for kicks, biting and scoff. The equipment needed for lavage has to be prepared.

A high-lumen tube has to be preferred for lavage (Ewald, Levacuator, Edlich), because food or other materials can easily block a lower lumen tube. Through wide tube gastric probes a great amount of secretion can be drained quickly. Insertion of the probe is most commonly done through the mouth. Tubes stay in their place only until the gastric lavage is finished and the complete gastric content is removed. Prepared, pre-packaged gastric lavage sets make preparation and gastric lavage easier.

Preparing an antidote

The most commonly used antidote in everyday practice is activated charcoal (carbo activatus, Carbo medicinalis). During the lavage salty purgatives, like sodium sulphate, magnesium sulphate, magnesium citrate can be put into the first rinsing liquid. If a heavy metal or arsenic is in the background of the poisoning, metallorum Sauter can be prescribed as an antidote after the lavage. If an organic solvent causes poisoning, giving 50-100ml of liquid paraffin is justified. Fuller powder is recommended orally in case of a bipiridilio, paraquat poisoning. If the poisoning has been caused by ethylene glycol, methyl alcohol, or glycol esters, it is justified to have the patient drink 12 dl of alcohol after the lavage, but still on the spot (Bakos et al 2011).

Process of the lavage, things to be done during the lavage

Before starting the intervention, the doctor's instructions concerning the lavage have to be revised. Do a hygienic hand wash and put on protective clothing. Prepare the equipment necessary for lavage. Identify the patient by checking his wristband, then place him into half-Fowler or Fowler position. If the patient, due to low blood pressure, cannot tolerate the bed hightened at the head-end, lay him on his left side, raise the end of the head of the bed, or lay the patient on his side. By placing him into the right position, the danger of aspiration of foreign substances into the respiratory tract can be reduced. Place a hygroscopic mat in front of the patient, place a kidney dish and paper napkins within reach of the patient.

Before starting the lavage, the chosen tube has to be inserted, its exact position in the stomach has to be checked. Lavage has to be repeated until the contents of the stomach have been surely emptied, that is, nothing else drains but pure lavage liquid. For this at least 6 liter of liquid is necessary. We might not use all the liquid up, but it has to be at hand by the patient's bed.

The nurse may choose from three lavage techniques (closed system, open system, or traditional lavage, done with the help of gravity), if the doctor has not prescribed a certain way of lavage concretely (Nursing Care Related to the Gastrointestinal System).

Closed system lavage

During the process apply disposable gloves, place a Y connector at the end of the probe. Attach physiological solution to one end, a suction equipment to the other. Enter 50-200 ml of the physiological salt solution, then drain it with the suction equipment. Repeat the process until the prescribed quantity has been used up, or the drained secretion is clear. At the end of the lavage the quantity of the entered and drained liquid has to be documented. The advantage of the closed system is that it minimalizes the risk of contact with other body fluids.

Open system lavage

During the process apply disposable gloves and personal protective clothing (clothes and face protection) drain the stomach secretion with a 50-ml catheter-tipped syringe. Measure and put aside the liquid drained. Pump up the lavage liquid into a 50 ml syringe, gently push it in, drain it again from the stomach, and press it into a cylinder. Go on with this process until the desired quantity of liquid gets in, or you get the desired result. Monitor the essential body functions (including temperature), and the tolerance towards the procedure. The patient's condition may be instable and constant reassessment may be necessary. Lavage can cause hypothermia, so body temperature must be monitored. Hypothermia goes together with moodiness and a change in the heart rate. Inform the doctor if the drained liquid does not clear after 20 - 30 minutes of lavage (it does not become pink or pale pink), or the patient does not tolerate the intervention.

Gastric lavage protocol

Equipment to be prepared:

- disposable rubber gloves
- protective clothing if necessary: protective cloak, face mask, protective goggles
- suction equipment
- Yankauer drainage set
- special gastric lavage tube (Ewald tube: 36-40 French)
- Y connector
- lubricant, anaesthetic gel
- 2-3 litres of bodywarm lavage liquid (38°C).
- kidney dish
- 50 ml syringe (for sampling),
- paper absorbant, paper napkin, towel, hygroscopic mat
- medicine as prescribed by the doctor
- ice in a bowl as ordered by the doctor
- hypoallergenic adhesive tape
- stethoscope
- infusion stand
- tools of securing the vein (peripheral venous catheter, catheter adhesive, torniquet)
- tools of intubation (Ruben-bag with a valve and mask, or anaesthetizing machine with manual respiration facilities; suction pump with suction catheter; laryngoscope; endotracheal tubes; tube connectors; syringe for inflating the cuff; vein clamp to restrain the airtube of the cuff; bite protector piece (eg, Guedel-tube); adhesive tape or suitable means for fixing the tube)
- tools of disinfection (antiseptic solutions for the hands, skin and surfaces)

Traditional lavage, done with the help of gravity (based on the law of communicating vessels)

Put on disposable gloves and protective clothing (clothes and face protection). After inserting down the gastric tube, you must wait until the gastric content drains. Then slowly pour the liquid into the funnel attached to the tube, lift it high, thus with the help of gravitation the liquid gets into the stomach. Then lower the tube/funnel under the hight of the patient's stomach and consequently the lavage liquid will drain into the funnel due to gravity. Pour the contents of the funnel into the prepared container. Keep on doing this process until the desired quantity of liquid gets in, or you get the expected result.

If lavage is done with this technique, it is essential to check if the patient has developed distention in his stomach. (Nosza 2000).

Things to be done after gastric lavage

After lavage is finished, secure a hygienic mouth wash and cleaning of the nose. Check the essential life functions, the status of the stomach. Place the patient back to bed for a rest, make sure his vital parametres are monitored, his state of mind is watched. A check of his reflexes can help his assessment. Inform the patient that he has been given a purgative and secure the opportunity to defecate. If the doctor treating the patient has ordered so, give liquid taken orally besides parenteral liquid replacement. Aspiration or laryngospasm can occur even in case of patients with a clear mind, the equipment driven down unseen can cause perforation of the oesophagus or gastrointestinal bleeding. Aspiration pneumonia can appear especially in case of petroleum poisoning.

Ensure the mechanical cleaning of the gastric lavage equipment, prepare the tube, the finger protector and the mouth toggle to be sterilized. Wash the equipment, but do not dispose of the drained gastric content until laboratory examinations clarify the conditions of the poisoning. If violence can be suspected, a forensic experts examination can also take place. Tidy the place according to the regulations of dangerous waste, waste storage and disposal. Make sure the test material together with the side card filled in gets to the laboratory. Document the procedure, including the quantity and type of the lavage liquid, the quantity and characteristics of the liquid drained from the stomach, the patient's condition and his tolerance of the treatment.

Table 2 The process of gastric lavage

	Steps	Explanation
1.	Do a hygienic hand disinfection.	To keep the rules of asepsis-antisepsis.
2.	Identify the patient, inform him about the necessity and process of the intervention.	This way the patient's fears can be reduced, his proper cooperation secured.
3.	Prepare the necessary equipment and the room for the intervention.	
4.	Do a hygienic hand disinfection and put on the rubber gloves.	To prevent nosocomial infections and cross infections, and to protect the carer.
5.	Place the patient into the right position. – Place the patient into half-Fowler or Fowler position. – If the patient, due to low blood pressure, cannot tolerate the bed hightened at the head-end, lay him on his left side. – Raise the end of the head of the bed or lay the patient on his side.	The risk of aspiration of foreign substances can be reduced by choosing the right position.
6.	Place a hygroscopic mat in front of the patient. Place a kidney dish and paper napkins within his reach.	
7.	Ask a conscious patient to open his mouth, put out his tongue and lean his head forward a little. Do a mouth rinse or draining if it is necessary. Insert the gastric tube. Check the right position of the probe. Inject 30 ml of air into the tube, while listening to the stomach with a stethoscope (if the tube is at the right position, you will hear a gurgling sound).	
8.	Place the gastric content into a labelled cylinder for further examinations.	
9.	Using one of the introduced techniques, enter and drain the lavage liquid.	
10.	Repeat the same procedure until the gastric content is definitely emptied or the lavage liquid is completely used up.	
11.	Monitor the patient continuously during the process e.g. for cyanosis, increased respiratory rate, nausea, retch. If the patient starts vomiting, support his chin overstrained (hyperextension) to keep the respiratory tracts open and to avoid aspiration.	
12.	If the lavage is finished and the tube stays in its place, close it.	
13.	If the tube has to be removed, close it or confine it and pull it out quickly and evenly.	
14.	Place the tube into the kidney dish or on the hygroscopic mat.	
15.	Remove all the used equipment from the bed.	
16.	Measure the complete drained quantity of the lavage liquid. To estimate the quantity of the gastric content, subtract the known quantity of the entered lavage liquid from the quantity of the drained liquid.	
17.	Tidy the patient's environment.	
18.	Handle the emerging waste selectively.	
19.	Do a hygienic hand disinfection.	
20.	Document the intervention: the time (day, hour), fix the name and title of the people doing the intervention, vital parametres (before, during and after the intervention), changes in the patient's condition during and after the intervention. Record the fact of the gastric lavage, the quantity and type of the lavage liquid, the composition, smell, colour and quantity of the liquid drained from the stomach, the patient's tolerance.	

Undernourishment

Undernourishment, the danger of undernourishment

The human body needs energy for the maintenance of its life functions and undisturbed operation. Under regular circumstances this energy is obtained by active nourishment from the environment, by taking nutrients. The nutrients ingested secure the required amount of energy from both a quantitative and a qualitative aspect, they make up for the losses. The balance of anabolism and catabolism ensures the stability which is required for the most optimal operation of the organism.

Decreasing energy levels are signalled by thebody, signals objectively come in form of hunger, irritability, confusion of mental orientation, action directed at finding and getting food. The body's pursuit of energy-balance is manifested as a need, which can be called the *nutritional need.* The body strives to satisfy the nutritional need with all its might, however, if there is no opportunity to take food from the environment, it secures undisturbed life functions by mobilizing its own reserves, meanwile trying to adapt to the changed conditions (e.g.: reducing non-vital life functions). If the replacement of nutrients permanently does not cover the need, and it uses up the energy reserves, malnourishment develops. Different illnesses and injuries can easily cause energy imbalance of the body, due to inadequate quality and quantity of nutrient ingestion, or changes of metabolism in the body can start pathological processes which worsen the physical status of the patient, and contribute to the formation of common complications, finally causing the death of the organism. Besides environmental effects, each illness or injury influences nutrition to a certain degree, permanently or temporarily. *Thus nourishment is an essential physiological need, and if it is not satisfied, it will lead to the permanent damage of the body.*

The degree of adequate nourishment or the deviation from it can be exactly surveyed and the conclusions drawn from the survey make the assessment of the nutritional status possible. Pathological nutritional states are summed up by the term *malnutrition* in the health care profession, and not exactly correctly though, this term is mostly identified with the notion of undernourishment

in our country. Undernourishment, or the degree of the damage in the patient's organism or estimating the risk of potential damage in case of undernourishment define the methods chosen for nutritional support. The methods to be chosen can be categorized under the notion of *Clinical Nutrition*. Present practice uses the name *artificial nutrition* referring to the fact that the methods and equipment supporting nutrition and the use of solutions used for nutrition are all artificial interventions. The artificial support of nutrition at the different levels of health care (basic care, professional home care, hospice, outpatient care, inpatient care) can be the most effective if its coordination is done by a *Nutrition Team*. Its members (doctor, nurse, nutritionist, chemist, economic expert, psychologist, physiotherapist) give their their supportive activities to the patient in need in a coordinated manner, at the level of their competences.

The notion of malnutrition

Malnutrition is an abnormal condition which occurs due to the relative or absolute lack or possibly the excess of one or more essential nutrients.

Absolute undernourishment belongs to the notion of malnutrition and so do the relative deficiencies or imbalances which come about if certain specific nutrients are missing, or on the contrary, they accumulate disproportionately.

Consequences of malnutrition

The nutritional status greatly influences the efficiency of therapeutic interventions, the seriousness of abnormalities caused by illnesses or injuries, the course of its consequences in general and in time, the possible permanent lesions and outcome.

The time of healing is prolonged, should it be either wounds or fractures. The tensile strength of operational wound tissues lessens. Susceptibility to oedema increases. Pressure sores become more frequent. Due to lack of proteins a negative nitrogen balance appears, as a consequence the immune defence decreases, septic complications occur more frequently. Bleeding and clotting difficulties can arise. Enzyme production can fall back, and different metabolic disorders can form. Due to all this, the time of medical care at the hospital is prolonged, the time of treatment is longer, the costs of care get higher.

Forms of malnutrition

Protein-energy malnutrition (PEM) is characterized not only by the calorie deficiency caused by the decrease in the macronutrients, but also by the lack of numerous micronutrients. The chronic state of calorie and protein deficiency is called *marasmus*, the nutritional lesion caused mostly by protein deficiency is called *kwashior disease* type malnutrition. The mixed form is the most common in a hospital setting.

Marasmus type undernourishment is characterized by the reduction of muscle proteins, visceral proteins have not or hardly decreased, fat deposits have decreased or disappeared, immune functions may completely cease.

Kwashior disease type malnutrition can be characterized by the reduction of visceral proteins, the presence of muscle proteins and fat deposits, the anergy of immune defence reaction.

The characteristics of mixed type malnutrition (Kwashior-marasmus) are the reduction of muscle proteins, the reduction of visceral proteins, disappearance of fat deposits, anergy of immune defence reactions.

Groups endangered by malnutrition

The groups endangered by malnutrition are infants and children, elderly people, people on an extreme diet, people suffering from chronic diseases, people on a vegetarian diet, alcoholics and drug addicts.

Causes leading to the development of malnutrition

- Each illness, which can be associated with impaired ingestion, digestion and metabolism of nutrients.
- Inability to eat or drink, caused by difficulty in chewing and swallowing (head or neck surgery, oral cavity diseases, head or neck tumors, radiation therapy of the head, neck or larynx, jaw fracture).
- Prohibition of nutrition through the gastrointestinal tract, appetite decreased to a great extent, chronic diarrhoea, uncontrollable vomiting.
- Inability to eat, in case of paralytic and artificially ventilated patients, after serious operations, or patients who suffered serious accidents. Furthermore, in case of depression, anorexia and loss of appetite in old age.
- In conditions which go with accelerated metabolism, or hypercatabolism of proteins (permanent fever, polytrauma, tumours, pulmonary diseases, burns, sepsis hyperthyroidism).
- Besides the factors mentioned above, strange environment, often unusual, tasteless and cold meals served at unaccostumed times can also contribute to the development of malnutiririon with inpatients. In some cases the therapy itself, too (certain medications, especially cytostatics, effects of radiotherapy).
- Iatrogenic malnutrition can also be a significant factor, the cause of which can partly be the nursing personnel's insufficient knowledge on nutrition and their inadequate approach.

Causes of iatrogenic malnutrition

First of all the hospital environment, but even the nursing home environment basically mean vulnerability for the patient. He cannot satisfy his nutritional needs adequately on his own even if he has the ability to do so, as he enters an organized, closed system, this is what surrounds him. Thus it is the responsibility of the caregivers that in their organisation the patients' nourishment, the meals, and if necessary, the process of artificial nutrition should be available for the patients with well-organized automatisms, responsibility, adequate professional knowledge and it should be approached, in a controlled way (as in all processes of a necessary intervention). This way malnutrition within hospital can be prevented. For this purpose on the patient's arrival and during his stay, great importance should be given to screening, assessing and continuous monitoring of his nutritional status.

Morbidity internationally and in Hungary

The number of patients suffering from malnutrition as a consequence of diseases can only be estimated, because there are no surveys of the actual conditions or research covering the complexity of patient care. Based on several domestic authors' accounts it can be estimated that 45% of inpatients suffer from moderate malnutrition right at the beginning of their treatment, serious malnutrition can be put at about 30%. The proportion of malnutritive states developed during treatment cannot even be judged by estimation in the field of domestic care.

Characteristics of malnutrition

Contributing factors:

- Underlying disease (short intestine syndrome)
- Conditions associated with accelerated metabolism (hypermetabolism) and/or increased breakdown (hypercatabolism) of proteins:
- e.g.: permanent fever, serious injury – first of all polytrauma, large body surface burns, sepsis, hyperthyroidism
- Difficulties of nutrient ingestion, digestion and absorption:
- e.g.: mechanical obstacles, malignant lesions, inflammatory bowel diseases, ulcers of the digestive system, fistulas
- Chronic diarrhoea and/or uncontrollable vomiting
- Greatly reduced appetite (the effect of increased and permanent stress)
- Prohibition of nourishment through the gastrointestinal tract (acute pancreatitis)
- Inability to eat or negativism (dementia, depression)

Risk factors

- Reduced nutrient intake (lifestyle)
- Unusual, tasteless and cold meals served at unaccostumed times (hospital nutrition)
- The nursing personnel's approach and insufficient practical and theoretical knowledge on nutrition (iatrogenic damage)
- Increased nutrient loss (vomiting, bleeding, diarrhoea)
- Strange environment (hospital)
- Lack of knowledge/information
- The effect of therapies applied for different diseases (medications, radiation therapy, etc.)
- Poverty

Complaints

- Change in body shape – thinness
- Metabolic complaints, bloating
- Poor appetite
- Feebleness, weakness
- Vomiting, nausea
- Abdominal complaints, pains
- Swelling of the limbs
- Difficult swallowing
- Complaints associated with excretion (diarrhoea, constipation)
- Loss of body mass

Symptoms

- Apathy, depression, behavioural disorders
- Reduction of skin turgor
- Reduction of the skeletal muscles (muscle atrophy)
- Decreased movement and stamina
- Dull hair, cracked nails
- Nausea, vomiting
- Diarrhoea
- Delayed wound healing
- Appearance of oedemas
- Formal signs of thinness (sunken face, lack of muscles)

General characteristics

- Increased nutrient need of the body
- Immune protection reactions reduced to anergia
- Reduced quantity of muscle proteins
- Reduced visceral proteins
- Emptied fat storages

Defining nutritional status

A detailed examination of the nutritional status and its result form an important basis for the identification of malnutrition or the risk of malnutrition. Once having the results, targeted and effective therapies can be developed. The detailed examination is successful and effective if the doctor, the nutritionist

and the nurse collaborate in the process at the level of their professional competence.

Detailed examination according to competences:

Doctor

- Physical examination
- Laboratory examinations

Nurse

- Nutritional status screening
- Body Mass Index
- Measurement of body mass
- Measurement of height
- Physical examination, assessment of needs

Nutritionist

- Anthropometric survey
- Bioelectrical impedance
- Direct calorimetry
- Daily energy intake/needs assessment

To form the exact diagnosis, the following questions have to be answered

- Are there signs or reasons indicating malnutrition?
- If so, the deficiency or excess of which nutrient(s) is it?
- How serious is the deficiency or the excess?
- Is there a disease which leads to malnutrition?
- What can be the cause of malnutrition?

The following steps can be identified as parts of the care process

During the first examination patients who are high risk from the point of view of nutritional status have to be filtered out. In necessary cases, a detailed nutritional status screening has to be done, supplemented with a survey of diet and dietary habits. The patient's daily average energy need has to be defined, and knowing this his diet complied, or the nutritional plan prepared. During the process of the patient's care, the steps of his nourishment have to be done continuously, while the examinations regarding his nutritional status have to be done at set times. The assessment of nutritional status consists of the evaluation of the results of the nutritional anamnesis, the physical examination, the anthropometric, laboratory and immune function tests.

Nutritional status assessment, recording the anamnesis

During the nutritional status assessment the aim is to explore the contibuting factors, the risk factors and the symptoms of malnutrition. The information obtained during recording the anamnesis and nutritional data help to decide if a detailed nutritional status check or a thorough nutritional/ dietary survey is necessary.

Identification of patients with high risk of undernutrition

In the circle of patients to be hospitalized, during the first status assessment an instrument has to be applied together with another screening method (NORTON scale), which is suitable for the identification of patients with high risk of undernutrition.

The aim of the screening is to find the patients whose chances of healing, due to their nutritional status, is worse than it could be ideally hoped, and who are more vulnerable from the point of view of complications. The method of screening is adequate if it is effective, cheap, practical, it can be done right after hospitalization, and repeated any time. In the literature of clinical nourishment several methods are recommended for the screening of nutritional status (MUST, NRS 2002, MNA, SNAQ, MST).

The nurse's role after the evaluation of the result of the screening method

After the evaluation of the screening results no special care is justified from a nutritional point of view in case the *low risk category* is set up. In case of the *medium or high risk category,* the nutritional status and the food eaten have to be monitored continuously. In this case the patient's doctor has to be informed about the result of the screening. In each shift for at least four consecutive days the nurse registers her experience about the daily quantity of the food eaten by the patient with the help of pictograms in the documentation of nursing. On the fourth day after the screening the patient's body mass is measured again. If there is an undue reduction in his body mass, and the quantity of the food eaten during these four days is in average less than half of the food served, the nurse recommends the patient's doctor and nutritionist a detailed nutritional and nourishment staus survey.

Survey of the physical status

After the anamnesis the most important step is the physical status survey. As nutrition deficiency affects the whole body, its consequences can be exactly seen all over the body, on the patient's general status and behaviour. It is essential that careful examination cannot be substituted with a short glance.

The following list can help with the systematic survey of the physical status: figure, general state, behaviour, physical activity, integument (skin, hairs, hair, nails), status of muscles, mouth mucosal, palate, status of teeth, tongue, swallowing ability, mode of nourishment, eating ability.

Diagnostic tests

The nurse measures the body mass, height, the BMI value and screens the nutritional status. Taking body mass and height is done with calibrated measuring equipment. The simple and quick method of measuring BMI is using the BMI calculator, it yields only an informative value, still it is suitable for screening. For screening the nutritional status an instrument should be chosen, with which the test is easily performable, which is quick and effectively shows the cases to be identified (the undernourished). The most important aspect here is that no matter which instrument is chosen, the local calibration test has to be done.

Setting up a diagnosis

Within the framework of the nursing process, the screening is followed by setting up the nursing diagnosis. The nursing diagnoses drawn up by the nurse decide the direction of the planning of nursing and the choice of nursing interventions.

Artificial nutrition

In the case of patients who can eat in a natural way, healing can be supported with different nutrient composition and consistency diets, and with supplementary drinkable formulas if needed. If due to a serious disease or injury the patient's oral nutrition cannot be, or only partially can be solved, his nutritional needs have to be satisfied by *artificial nutrition* (enteral, parenteral), built into the general therapy. The primary aim of artificial nutrition is to prevent the development of malnutrition, elimination or reduction of abnormal nutritional status found at the nutritional status survey, stabilization of the organism's energy balance. The complex processes of the activities yielded by the different professions at different care levels, which support or substitute the patient's personal nourishment needs, are called *Clinical Nutrition.* This notion means not only giving different nutrients during enteral and parenteral nutrition, but also covers the field of organization, training, opportunities of consultancy, scientific research and studies, publication, introduction of new techniques, application of the quality management processes (guidelines, protocols, process descriptions), the exploration of financing problems, the coordination of the linking tasks of the different sites of care (basic, outpatient, inpatient care).

Planning artificial nutrition

The care plan

When the patient is hospitalized, besides checking his personal data, both the doctor and the nurse get to know his detailed anamnesis, and check his health status (physical status).

After that, as part of the needs assessment, the *nurse* decides on the checks to identify patients at high risk (pressure sores, nutrition, falls, etc.). Having the information and after identifying the patient's problems and needs, she establishes the nursing diagnoses (priority).

Having acquired the information and after examining the patient, the *doctor* establishes the direction diagnosis, then he makes diagnostic, therapeutic plans (priority).

The *nurse* and *doctor* who take part in the patient's care have a consultation when they discuss all the obtained information which is important in the patient's instant care. If the patient is high risk from a nutritional aspect, according to the doctor's diagnostic plan, the *nutritionist* joins them, who is informed about the data gained so far, performs the patient's complete nutritional status survey and a nutrition survey, then calculates the patient's daily energy demand. Then comes the joint consultation of the *doctor,* the *nurse* and the *nutritionist,* when they discuss the nutritional strategy. The outcome is recorded by the doctor/ nutritionist as the nutritional plan. The nurse puts the prescriptions of the nutritional plan into the patient's nursing plan. When preparing the therapeutic plan, the doctor/nutritionist considers the possibility of artificial nutrition, in each case takes the underlying illness, its effects and consequences, the actual status of the organism into account.

As these are different from patient to patient, and even in the case of the same patient can be different in time, artificial nutrition can be applied only individually, while constantly checking the patient's status.

The nutritional plan

Basis:

The exact knowledge of the patient's nutritional status and nutritional problems. The knowledge of the nutritional method decided by the doctor. Adequate communication between the members of the nutritional team, the patient and the patient's relatives.

Content elements:

Nutritional anamnesis, detailed nutritional status survey, daily energy and nutrient demand, the method of nutritional support, instruments for dosing formulas, naming the formula to be applied, its daily quantity, dosage, the dilution ratio if necessary, constant monitoring of the nutrition, checking the patient's general/nutritional status, controlling the complications of nutrition, periodic check of nutrition therapy (indicating the periods), orientation of the patient, dietary consultation, education of the patient, documentation.

The ways of artificial nutrition

Reviewing artificial nutrition several systematizing principles can be outlined. One of these principles is when two large goups are created based on the duration of nutrition and the types of illnesses and diseases. One group is nutri-

tion applied for a relatively short period, supporting, substituting, preventing some acute condition, while the other group is nutrition balancing the effect of a long-lasting, primarily chronic illness, or compensating insufficient nutrient utilization or nutrient intake. The general professional rules and principles applied are identical in both methods, the differentiation is necessary first of all because of the place of care, planning, organizing and coordinating the nutrition therapy.

The other principle considers the condition of the sick body, the eating ability, the process of healing, the potential outcomes of the existing illness when it divides the opportunities of adequate energy and nutrient supplementation according to the modes of artificial nutrition.

The practice of enteral nutrition

The first thought in supporting or substituting natural nutrition is always to follow the most natural way. This can be realized by different nutritional methods in the gastrointestinal tract from the oral intake of d nurtrient solutions which the patient can drink, to the different enteral feeding methods through tubes and stoma devices.

When choosing the method of enteral nutrition the following have to be considered: the patient's underlying disease, the accompanying diseases, their general nutritional state, the stability of their metabolism, their eating ability, also the expected period of nutritional inability, and the functionality of the gastrointestinal system.

Inserting devices suitable for nutrition can be regarded as a therapeutic intervention. According to the chosen nutritional method it can be the nurse's dependent task on the doctor's order (in case of nasogastric or nasoduodenal probe insertion), while insertion of the nasojejunal probe, PEG, PEJ is the doctor's task.

The definition of the method of enteral nutrition, which is the doctor's competence, also defines the nutritional strategy, the application of the selected nutritional proceedings.

Applicable enteral nutrition methods

Nutrition methods

- *Oral intake of drinkable nutritional formulas* for supplementing natural nutrition.
- Short-term nutrition *through a nasogastric/nasoduodenal or special feeding tube.*
- *Feeding through a jejunal tube* for 24 hours continuously, but for shorter periods of time, from several days to several weeks, primarily in case of acute diseases.
- *Application of enterostomata,* especially for long-term nutrition, for several months or years, mostly in case of chronic diseases.
- Percutaneous endoscopic gastrostoma (PEG) or PEG-Button (One of the most frequently applied method in long-term nutritional therapy.).
- Percutaneous endoscopic jejunostoma (PEJ).
- Fine- needle-catheter-jejunostoma.

Enteral formulas

Enteral feeding formulas have undergone a great development in recent years due to modern medicine. Formulas are industrially produced nutritional materials having a special composition, which serve for complete or supplemental nutrition. Due to their specific features they are suitable for satisfying special nutritional-metabolic demands justified by age characteristics and/or illnesses. Formulas can be divided into infant and medical formulas.

In enteral nutrition therapy exclusively industrially produced, sterile formula with a determined nutrient and energy content can be used for feeding. For adequate therapy the application of modern equipment supporting probe feeding is necessary.

Dosing enteral formulas

Drinkable nutritional solution to supplement natural nutrition can be given orally during the day *dosed* according to the patient's tolerance.

24-hour continuous dosage, through a gravity device or nutri-pump.

Intermittent dosage, continuous in certain given periods of the day, through a gravity device or nutri-pump.

Formula given with a special syringe in greater boluses, continuously, several times a day.

Dilution of enteral formulas

Generally, it is not recommended to dilute formulas, they have to be chosen from the adequate calorie and osmolarity formulas and altered according to the patient's tolerance.

Storage regulations of enteral formulas

When storing formulas shelf-life always has to be observed, and a properly clean, cool storage place secured (it cannot be stored in direct sunlight). After opening the formula it has to be used up within 24 hours. If the complete quantity of the formula is not used right away, the remaining part has to be labelled. Then it has to be stored in a refrigerator (+3 nnnn- +8 C°). Before usage the formula taken out of the refrigerator has to be warmed up to room temperature. Cold formula must not be used in the tube.

Enteral nutrition devices

Just like the development of formulas, the development of feeding devices has gone a long way in recent years. PVC tubes used earlier hardened during usage, so they caused local pain and tissue damage to the patients. The thermoplastic material of modern poliuretan or silicone rubber probes decreases the risk of the development of nasal-musosal pressure sores (decubitus) or the development of sinusitis. These tubes are already suitable for permanent usage, they can be placed not only into the stomach, but also into the right passage of the small intestine, even using endoscopic technique. Accurate dosing can be achieved with the help of feeding pumps. The machines are small, their handling and cleaning is easy. They can be mains or battery operated.

General features of probes suitable for nutrition, and of other devices

The material of the tubes can be rubber, plastic, silicone or poliuretan. The marking of the lumen diametre is French. There are types, where a wire gives out X-ray signals, on X-rays these seem to be transculent areas. Subtypes: short, standard (medium), long, some of them can be forwarded to the small intestine.

General aspects of structuring enteral nutrition

- Knowledge of the factors influencing nutrition structuring.
- If natural feeding can be continued by probe feeding without interruption, usually there is no need to do the structuring.
- Considering the degree of undernourishment.
- The daily energy need has to be controlled continuously, daily food intake has to be gradually increased according to it until the necessary limit is reached, in each case the patient's individual tolerance and the professional recommendations have to be observed.

Hygienic principles of enteral nutrition

At each activity of the nutrition the hygienic rules must be kept to avoid infections: clean working area, hygienic hand wash, observing the rules of asepsis, keeping the probe and the tubing clean, storage of unopened and opened formulas, cleanliness of the device inserted into the patient and of the affected skin surface, keeping the patient's hygienic needs in mind, keeping the patient's environment clean.

Documentation of enteral nutrition

It is advisable to fill in the "Nutritional therapy sheet" in each case as part of the health care documentation.

The patient's education in case of nutrition

One of the most important independent tasks of nursing is the patient's and/or the relatives' education. At the same time it must be emphasized that just like nutritional therapy, the *patient's eduaction* associated with it is also *team work,* where all the team members have their own tasks. The patient's education has a great significance in artificial nutrition because *successful cooperation, the observance of handling instructions* contributes to the success of the nutritional therapy.

During education the nurse follows the right procedure if she mainly *gives advice, teaches, shows, explains.* She *makes the patient practise* the necessary operations, checks and if necessary, *modifies* the patient's self-care activity. She monitors the patient's experiences, feelings, they discuss the emerging problems together. She *accepts* the patient's aversions against the therapy, recognizes his repressed anger and rage. One of the most difficult questions of long-term tube feeding is how it is possible to live together with it. It is a long progress on the patient's side to accept having the tube.

Educating the patient is a *process* (not a single occassion), during which the nurse also has the opportunity to give the patient spiritual guidance, this way he has better chances of restoring his self-sufficiency ability. During this process she must aim at returning to already taught knowledge and activities, *repetition* is necessary. Besides *continuity, regularity* and *gradation* are highly important. These four aspects provide a suitable frame for the *educational plan* to be made, in which besides activities and knowledge to be taught the timing also has to be determined. Before starting the education, the patient's *cooperation ability* and the *ability to absorb new knowledge* have to be surveyed. It is usually well assessable in the care process when the patient and the nurse meet.

Checking enteral nutrition

Fluid and electrolyte balance

- Daily liquid demand should be adjusted to the patient's condition.
- The fluid content of the formula and that of the rinsing liquid have to be considered when determining the daily liquid and electrolyte demand.
- The liquid supply of the patient's organism has to be checked daily (body mass, oedema, turgor, state of the tongue, the quantity of liquid ingested and excreted).

Recognizing complications

Monitoring the complications of feeding is done continuously during feeding. The patient's doctor has to be immediately told if any complications occur, right after the feeding is finished. The fact of complication-free feeding has to be recorded in the nursing documentation in each shift.

Entering formula orally into the organism

If the patient is able to eat or can be fed through his mouth, and his appetite is satisfactory, his increased nutrient need can be secured with flavoured clinical formulas (e.g.: Nutridrink, Ensure). The patient consumes the fluid formula as a supplementation of the necessary diet, if swallowing and the gastrointestinal function are effective. In these cases the right formula can be chosen based on the demand for special formulas or the increased demand, thus complementing the nutrient and energy content of the food taken each day. (E.g. high energy content, high protein content, waste-free nutrients, organ-specific formulas.) Besides these, enteral formulas in powder form can be used, which can be mixed into the food using the different food preparing techniques. This way the calorie content and nutritional value of the food can be raised (E.g.: Nutrison Powder).

Delivering food into the stomach through a nutrition tube

Primarily a specially developed probe can be used for nutrition, but in domestic practice it is wide-spread to use a traditional nasogastric tube for this purpose also. Both tubes can be selected in several sizes, the materials of both correspond to the expectations of short term application. However, while the out-of-body end of the feeding tubes contains an end part which closes well, the external part of the nasogastric tubes ends in a small funnel so that other devices can be attached. Using the latter temporary closing can be achieved by other devices (e.g.: kocher, plastic spigot). Both tube types are inserted into the stomach through the nasal cavity and the oesophagus.

Contraindications of tube feeding: uncontrollable vomiting and/or diarrhoea, unrelenting haemorrhage from the gastrointestinal canal, uncontrollable paralytic ileus, ileus, diffuse peritonitis associated with paralytic ileus, severe circulatory failure, shock, severe turbulence of the water-electrolyte and acid-base balance, serious respiratory failure.

Relative contraindications of tube feeding: gastrointestinal ischaemia, severe pancreatitis, "high" bowel fistulas, caustic poisoning.

The patient's preparation for probe insertion

The general aspects are identical with the ones described at nasogastric tube insertion (Chapter II). For feeding the patient has to be placed into bed rest. Be calm and friendly with the patient, pay attention to his feelings concerning the intervention.

Preparation of the equipment

The descriptions of the equipment necessary for tube insertion are identical with the ones described at nasogastric tube insertion.

Preparation of the formula

During the preparation of the formula you have to check the type and the quantity of the formula prescribed by the doctor, the frequency and the speed of feeding, the form, quantity and dosage of the medication prescribed, the frequency and method of giving it.

In case of industrially produced formulas, the best before date has to be checked each time before usage.

Check if the formula is homogeneous and lump-free. In that case the formula must not be used. If the formula has been stored in a cool place (refrigerator), it has to be taken out an hour before usage, so that it can warm up. Cold formula must not be given to the patient. If the formula has been prepared by a nutritionist or a chemist, check the preparation date and time. Opened formulas, older than one day old, must be disposed of. Industrially packaged sets and enteral tubes make continuous nutrition possible.

Structure of nutrition

In the nutrition plan the determined daily maximum quantity of the formula, containing the desirable quantity of calories, has to be divided evenly in a 24-hour time frame, keeping the feeding intervals in mind. Nutrition has to be built up gradually, formula portions have to be raised corresponding to individual tolerance. Nutrition is done either intermittently or in boluses, in both cases the gastric retention and reflux must be checked before giving each new portion. Before and after giving the formula the tube has to be washed with 30-50 ml washing liquid.

Things to be observed

During tube feeding the patient's nutrition status and laboratory parametres have to be checked as prescribed. The responses given to the previous food intake have to be assessed.

Prevention of complications

To avoid incidental complications during probe feeding, special care must be taken to the patient's body position. The inserted tube has to be checked daily, it has to be kept clean, dry, free of formula and secretion. The equipment used for feeding must be replaced, the devices kept clean.

The patient's education

During a long-term treatment, the patient's and probably the relatives' and other nurses' education about taking care of the probe is essential. The patient should be encouraged to take care of the tube on his own. On the first few occasions, stay with the patient, help him and answer all his questions. Correct any mistakes or wrong techniques if necessary.

Gastric nutrition through a stoma device

Nutrition through an opening in the stomach wall is considered to be an invasive intervention. As far back as the middle of the last century, doctors were interested in creating an artificial orifice for feeding purposes. Since the elective operational technique to the interventions done with the endoscope nearly one hundred years passed. In 1980 Gauderer and Ponsky submitted the percutan endoscopic gastrostoma (PEG) formation method. Soon after that the method spread quickly and it developed further. Nowadays the endoscopic method is used in most of the cases, but there are also special cases when choosing the operational technique is the only solution. The contradictions of the endoscopic method are esophageal stricture, obstruction, duodenal obstruction, previous gastric surgery, obesity, ascites, trismus.

PEG indications

Impairment of the central nervous system (trauma, cancer, stroke), psychiatric disorders (dementia, depression, anorexia nervosa), upper respiratory tract and gastrointestinal lesions (trauma, tumor).

PEG relative contradictions

Major abdominal surgery prior to the intervention, major meteorism, trismus, severe obesity, stricture requiring dilation.

PEG absolute contradictions

The endoscope cannot be led through the oesophagus, the wall of the stomach is not transculent, tense ascites, severe coagulation disorder, peritonitis, sepsis.

Making percutan endoscopic gastrostomia (PEG) with the deletion method

The objective of the formation of the gastrostoma is to make patiens with inability to swallow be able to be fed enterally. If used properly, the probes can function even for years. The lifespan of the probe depends on the quality of usage. The time of replacement is equally influenced by the underlying disease, its progression, and the type and material of the probe. Replacement of the probe is justifiable only in case of dysfunction.

Frequent causes of complications accompanying PEG usage, nutrition, and treatment

Concerning the intervention: abdominal abscess, peritonitis, ileus.

Concerning feeding and treatment: dermatitis, stomach contents and feeding formula overflow beside the feeding device, obstruction, injury or displacement of the tube. Make sure once each day that the device placed in the stoma orifice can be moved freely, the formula is not given too quickly, it is not contaminated, the temperature is not too hot or too cold.

Symptoms, complaints: bloating, nausea, vomiting, abdominal cramps, diarrhoea, aspiration.

The patient's preparation for nutrition

Nursing care involves caring about nutrition, maintenance of the feeding tube, skin care at the place of the stoma device, furthermore, it monitors the patient's condition during nutrition, sets the pace of the feeding schedule, prepares the patient for self-sufficiency after hospital treatment is finished.

Preparation of the formula

When giving an industrially prepared formula through the stoma device, a plastic dispenser bag is often used by the nurses, which can always be refilled afterwards. With this dosing technique care must be taken that the plastic container bag should be washed clean immediately if there is an interval between the feeding times.

The industrially packaged set and the enteral tube make continuous nutrition possible. If the aim is not feeding continuously, but in boluses, the formula should be chosen accordingly. Make sure the given formula is at room temperature. Cold formula may cause a gastric cramp. Within the institutional framework in each case only industrially produced, sterile formula can be used for feeding.

The procedure of nutrition

About two-three hours after the PEG-tube has been placed, feeding can start. As the first step physiological saline salution can be given, then using industrially produced probe formulas gradually change from the less and less diluted to the undeluted, and to the right dose in a few days. *Before starting feeding, always do a hygienic hand wash.* Always keep the necessary equipment, the patient's environment and the patient very clean and tidy. Check the position of the tube daily on the basis of its type.

During bolus nutrition attach the syringe filled up with the ordered formula to the proximal end of the gastrostoma tube, then enter the content of the syringe *slowly* watching the prescribed quantity.

After feeding in the formula, always clean the stoma device with clear water, the clasp can only be closed if it is clean.

In case of continuous feeding, use an infiusion pump, set the required speed. To keep up exact dosage check the gravity drop number and the speed of the infusion pump every hour.

When the *feeding is finished,* rinse the tube with clean water, then close the proximal end. *Make sure you keep the used equipment clean continuously during and after feeding.* The daily quantity of the entered and excreted liquid, as well as the quantity of the formula fed to the organism have to be recorded.

Check

Taking the right posture during feeding, checking the position of the tube, careful skin care, giving sterile preparation can be the method of avoiding complications. Signs of infection have to be checked out, e.g. secretion, redness of the skin, sensitivity and warmth. Excretion of urine and stool has to be checked daily. The patient's fitness and nutritional status have to be monitored continuously.

Care

During the care of the exit site of the stoma device, daily skin care has to be maintained . To take care of the stoma, use the professional protocol of wound care. If during daily care the patient indicates pain, there is an inflammation on the skin area or leakage of large quantities of gastric content by the tube, the patient's doctor has to be notified immediately.

Feeding certainly has to be stopped until then.

Patient education

After hospital treatment the patient's education plays a great role in the paitent's preparation for self-sufficiency. Give advice to the patient, the family members, or other professional carers on eneteral feeding, taking care of the stoma device and the stoma orifice. Inform the patient about the signs and symptoms which they must report to the doctor immediately, define emergencies, review the necessary things to be done by the nurse in these cases.

Documentation

Document the following on the care sheet: the daily quantity of the formula prescribed by the doctor, the date (day, hour) of feeding, the quantity of the given nutrients and water during the individual feeding actions, the daily cumulative amount of nutrients and water, the way of food intake, the quantity of residual gastric content, the quantity of given and excreted fluid, occurring complications, the result of the abdominal examination, the patient's tolerance towards feeding and the formula, topics for the patient's education, advance in the patient's self-sufficiency.

Nutrition into the small intestine (jejunum) through a feeding tube

Nasojejunal nutrition is used most of all in the cases of acute pancreatitis, however, it can also be justified after head and neck surgery, and major surgeries of the upper gastrointestinal tract. There are two opportunities for the professionals to satisfy the patient's nutritional needs. One of them is *parenteral food intake,* the other one is *enteral feeding* (McClave et al 1997).

Both techniques are good solutions, but in case of acute pancreatitis placing the diseased organ into the greatest possible rest is a significant factor, determining the patient's fate, which cannot be achieved by any of them. Stimulating the stomach by some food of any compound or consistency increases the enzyme production of the pancreas.

If, however, the right formula is fed continuously via the tube to the part of the jejunum which is further away from the duodenum (second, third jujenum tendril) the therapeutic objective is achieved, that is, the enzyme production of the pancreas can be reduced to the basal level in the acute state of the inflammation (Bálint et al 1993, Harsányi et al 1991, P. Potter et al 1999).

The advantages of jejunal nutrition

- The adequate energy amount can be sent to the body without the irritation of the pancreas – thus catabolism can be turned back.
- Bacterial translocation can be prevented, feeding of the intestinal mucosal can be realized.
- Intestinal motility improves, paralitic ileus does not develop.
- Functional decline of the small intestinal mucosal enterocytes, and
- their atrophy.
- Circulation of the splanchnic area improves.
- Physiological bacterial flora is sustainable, which is necessary for the formation of short-chain fatty acids.
- Reduces the number of inflammatory responses and sepsis.
- Less expensive than parenteral nutrition.

A The patient's preparation for feeding probe insertion

Before the intervention the patient has to be informed about the process of the intervention planned. Of course, the intervention has to be done on an empty stomach, in fact in practice the most trouble is caused by a pill taken with a sip of water or coffee. This problem can be prevented if the patient is informed in time and the right time of taking the medicine is planned beforehand.

Jejunal feeding probe insertion technique with an endoscope

Tube insertion can be performed with the help of peristalsis. In this case the conduction is the same as with the insertion of a nasogastric probe. But in most cases it is done with the endoscopic technique (Seldinger method) under the control of an image intensifier. This way the probe can be inserted as far down as the middle part of the small intestine (the second jejunum tendril).

Process description

Right before the intervention the patient receives medicinal preparation.The patient has to be placed in the right posture (lying on the left side) on the examination table, then getting to the duodenum with the endoscope, the wire and the 10Fr diametre feeding probe have to be pushed forward to the jejunum tendril. After fixing it with a sliding catheter, the endoscope has to be removed from the feeding tube. Through the mouth cavity the tube has to be led out through one of the nostrils. The place of the tube has to be monitored by X-ray, applying a contrast agent. An attachment has to be placed on the probe end out of the nose, to which the infusional and feeding tube tubing can be connected. The tube can be fixed with a piece of one centimetre wide gauze at the nostril orifice, after its optimal distance from the jejunum tendril has been marked with a colour adhesive tape.

Special nursing tasks after nasojejunal feeding probe insertion

You have to make sure the patient can spend a few hours on bed rest after the intervention. The patient's general status and vital parameters have to be checked. The correct position of the inserted feeding device has to be checked. Taking part in the preparation of the nutrition plan, modification of the nursing plan accordingly. Implementation of the nutrition plan. Surveying the patient's cooperational ability. Involving the patient in the nutritional process. Securing the right posture for feeding.

Recommendations for jejunal feeding

It is advisable to start feeding at the earliest possible time, but not later than within 72 hours. This is why nursing activity always has to be done according to the fixed nutritional plan. Besides ordering the daily formula demand, the daily liquid demand has to be fixed, too. (The daily fluid need can also be given through the feeding probe. If not, it has to be supplemented parenterally.) The desired dosing method is continuous dosing, if possible with a formula feeding pump. With the continuous build up of the nutrition the development of complications can be prevented. Formulas dosed in boluses can cause dumping syndrome in the duodenum and the jejunum. If this happens, it will cause a serious problem that the digestion and also the absorption in the distal small intestine will be disturbed. As a consequence the gastric emptying will slow down, the patient will complain about feeling of fullness and nausea. When the patient's condition improves (normalization of enzyme values, reduction of pains, improved pancreas status confirmed by ultrasound, the patient's improved clinical condition), besides jejunal probe feeding the natural nutrition and diet can be gradually built up again. First of all, with the strict guidance of the nutritionist a small amount of carbohydrates, protein and liquid must be incorporated (Nutrition plan). The nutritionist's advice to the patient and the patient's relatives all through the nutrition has a great significance.

Construction of nutrition

According to individual tolerance the portions of formula have to be raised, nutrition has to be built up gradually. The daily total quantity of the formula should not exceed 2000-2500 ml. In case of nutrition directed into the small intestine most of all continuous nutrition is applied. Even in this case there is an opportunity to insert two or three short intervals when feeding is paused. These intervals, however, should not be shorter than 5-10 minutes on each occasion. It is appropriate to rinse the probe every four hours. (The need for intervals usually arises in case of the patients who are able to care for themselves.) Before and after giving the formula the probe has to be washed with 30-50 ml of washing liquid. The equipment used for feeding has to be replaced each day.

Nursing tasks during the nutrition to support the patient's physical activity

The nurse should support the maintenance of the patient's muscle strength keeping the patient's condition in mind, he should be involved in his daily care (sitting up, turning, standing up, walking). If the patient is able to do it, encourage him to take a short walk several times a day (from 2-3 minutes up to even 15 minutes). Consider the possibility of family involvement in maintaining the patient's movement. If a physiotherapist also takes part in the patient's care, making the patient and expecting him to practise the exercises prescribed can greatly improve his condition. The patient's spiritual support has to be taken care of, talking and an empathic approach increases his mental strength.

The practice of parenteral nutrition

Planning parenteral nutrition

The primary aspect during planning parenteral nutrition is that it is only necessary and permitted to be applied if the patient cannot be or cannot be satisfactorily fed enterally. As to the duration of parenteral nutrition, it can be applied from some days to even several years depending if it is neces-

sary on the basis of the indication of an acute state or some chronic illness.

The principles of the care plan for parenteral nutrition are identical to the ones described in the chapter on artificial nutrition. A patient having a parenteral nutrition need belongs to the high risk category in each case, so it is extremely important that he should receive the energy intake according to his needs for as long as necessary, to the necessary extent. Giving the parenteral formula in the selected way should be done using the adequte equipment, taking the vital functions, the right tissue perfusion, the elements of the homeostasis (first of all isovolemia, isoionia, isohydria) into consideration, with the minimization of the risk of nosocomial infections associated with the intervention.

ASIC PRINCIPLES OF PARENTERAL NUTRITION

Parenteral nutrition must be structured gradually according to the clinical situation (e.g.: postaggression syndrome, protein-energy malnutrition), as well as considering the patient's actual state (e.g.: cardial decompensation, diabetes mellitus), to cover the scope of the individual need completely.

Efforts should be made to secure the minimal enteral intake during parenteral nutrition, that is, the nutrition of the villi shoud be secured (minimum 250 ml enteral formula/24 hours), the soundness and function of the gastrointestinal mucosa, also the production of the enzymes, hormones and bile should be maintained, helping the prevention of bacterial translocation (endogenous sepsis).

Application of complete parenteral nutrition is usually needed only for a short period, which can be followed by partial parenteral nutrition and/or enteral tube nutrition before independent adequate quantity and quality oral nutrition can be started.

The daily energy demand has to be satisfied with using carbohydrate and fat emulsion. The calorie value of amino acids cannot be used for calorie need coverage, because their function is building functional and structural proteins.

The carbohydrate-fat ratio can vary between 70:30% and 50:50% depending on illnesses and on the patient's condition. The energy need can be covered permanently by giving carbohydrates and fats together. If only carbohydrate solution is applied in great quantities, the risk of the development of steatosis increases.

When burning fats, less CO_2 is released than while using carbohydrates, it is advisable to cover the largest proportion of the energy demand with fats, mostly in diseases associated with high CO_2 levels, e.g.: respiratory failure.

With the daily ingestion of essential and nonessential amino acids, the elements necessary for building the essential amino acids and nitrogen can be continuously supplied for the patient.

When compiling the daily liquid plan, the liquid quantity of the parenteral nutrition must be considered.

Laboratory monitoring is necessary, because this way the degree of nutrient utilization can be traced during structuring the nutrition. Routine laboratory examinations are justified all through the period of the complete parenteral nutrition, but their frequency is different during an acute, a stable phase or a permanent nutrition. Besides, infancy or old age, serious liver, kidney or lung dysfunction, multiple organ failure, severe coagulopathy, expressed metabolic imbalance as existing conditions all play the role of a qualitative and quantitative factor in monitoring.

When starting parenteral nutrition strict clinical monitoring cannot be replaced by anything. Nutrition has to be suspended in case any abnormal signs appear.

During complete parenteral nutrition the formula must be dosed through an infusion pump, because inaccurate, uneven, or accidentally too fast dosing can cause severe metabolic and other failures and complications, which, in case of a patient in critical state can even be fatal.

The method of giving the nutrition formula, whether through a central or peripheral vein, is not determined by the method of feeding, but by the osmolarity of the solution to be given.

During parenteral feeding the patient's electrolyte need has to be checked and supplied.

In case of long-term nutrition or a very serious general condition the supply of vitamins and trace minerals has to be started in due time.

METHODS OF PARENTERAL NUTRITION

Complete parenteral nutrition (CPN), is the kind of nutrition during the application of which the supply of amino acids, carbohydrates, fats, vitamins, trace elements and electrolytes is given intravenously, avoiding the gastrointestinal tract, supplemented with villous feeding if possible.

During partial parenteral nutrition (PPN) to supplement enteral nutrition, amino acids, carbohydrates or fats are given with the aim of saving proteins. Neither in quantity nor in composition does it cover the complete demand.

Indications of parenteral nutrition

Enteral nutrition does not correspond to the demands of the body or it is contraindicated.

- In case of normal nutritional status, after more than 7 days of deprivation.
- If the patient is undernourished, parenteral feeding must be started as soon as possible after the primary stabilization.
- In connection with major gastrointestinal operations, if enteral nutrition is not viable, parenteral nutrition is recommended in terms of the following aspects:
- If the patient is malnourished, it should be started 5-7 days before the operation and continued in the post-operative phase.
- It is not advisable to be started directly in the post-operative phase, but with a delay of 5-7 days.
- Parenteral nutrition is justified only if it has to be applied for more than 7 days. If parenteral nutrition is shorter, the expected risk may be greater that the benefit.
- Parenteral nutrition can be stopped if more than 60% of the daily calorie demand can be supplied enterally.
- *Conditions demanding parenteral nutrition may be:* trauma, burn, major surgical intervention, acute and chronic infection, bone marrow transplantation, inflammatory bowel disease, short intestine syndrome, mucosal injury after chemotherapy and radiation therapy, advanced cancer, immune deficiency.

Contraindications of parenteral nutrition

- acute phases of diseases, operation, direct post-traumatic states
- shock of any cause
- serum lactate > 3-4 mmol/l
- Hypoxia pO2 < 50 Hgmm
- severe acidosis pH < 7,2; pCO2 > 80 Hgmm
- if enteral intake suits the demand both qualitatively and quantitatively
- ethical considerations.

Possibilities of dosing parenteral solutions

To carry out parenteral nutrition effectively, plastic cannulae and branules of different lengths, diametres and materials can be used. When selecting the site of the puncture numerous factors have to be considered such as the patient's condition, the risks of the infectional and non-infectional complications of the chosen site. The ultrasound controlled puncture technique significantly reduces the proportion of complications.

The type of branules and cannulae should be determined to suit the site of application. The devices starting from the periphery and ending at the very same place can be summarized as branules. The ones which start out from the large veins and can be led up to the border of the heart and the great blood vessels are called cannulae.

During nutrition the selection, the insertion and the care of the venous catheter has a definitive role in the development of complications.

THE PACE OF DOSING NUTRITIONAL SOLUTIONS

Continuous, that is daily 24-hour nutrition, which is applied most of all to treat acute states, it is also recommended in the initial period of building up parenteral nutrition.

Intermittant, that is a 12-hour nutrition is followed by a 12-hour interval. The nutrition period is often at night, so the patient is not tied to the bed and the infusion pump during the day, this way he can lead a more active life.

On certain days the formula has to be given for 8-12 hours (e.g. Monday-Wednesday-Friday night). If the patient's condition is stable, the already built up, permanent home parenteral nutrition is a well-appliable method, which does not or hardly affects the patient's lifestyle.

Parenteral solutions

Parenteral and other solutions (vitamins, trace elements, other supplements) nowadays can be found assembled in many different ways. The necessary data are available for the application of CPN and PPN through both peripheral and central veins.

Preparation of parenteral solutions

MAJOR RULES OF PREPARING PRODUCTS, SOLUTIONS

Only intact preparations in undamaged packaging must be used, always.

- To be checked:
- the identification of the product as described in the nutrition plan
- the osmolarity of the solution
- if it is a two- or three-cell preparation, the integrity of the separating membranes
- the best before date of the preparation
- the colour and the consistency
- duration of applicability from the opening date
- compatibility, in case supplementary solutions are prescribed

During preparation special attention must be given to:

- blending and adequate shaking of the multi-chambered bags separated by membranes, containing the compound solution
- supplementary solutions can be injected into the preparation only afterwards
- reserving the sterility of the supplementary solutions while blending them to the basic solution
- the patient's identification on the label of the solution
- recording the opening and blending time exactly.

MAJOR ACTIONS OF BLENDING PARENTERAL SOLUTIONS

- Preparation of the closed room
- Preparation of the working area
- Preparation of the nutritive solution and other solutions to be blended
- Preparation of materials and eqipment
- Surface disinfection
- Hygienic hand wash
- Blending
- Documentation
- Attachment of the infusion tubing to the bag containing the nutritive solution
- Preparation and installation of the infusion pump
- Restoration of the order of the working area.

Attachment of parenteral nutritive solutions, cannula care

This sequence of operations is significant and deserves special attention because the rules of asepsis are the most often broken here, the most serious consequence of which may be sepsis. The implementation of parenteral nutrition is a time-consuming task, enough time must be devoted to it (compilation, blending of the nutritive solution, installation of the infusor, handling of the cannula and branule, attachment of the nutritive solution to the cannula or branule, monitoring the process of nutrition, monitoring the patient) in order to give a chance to the improvement of our patient's condition.

Hygienic rules

Our aim is to minimize the number of nosocomial infections. For this purpose general hygienic rules must be kept. Within the framework of the patient's education the same strict rules and regulations have to be taught to the patient parenterally feeding himself at home, as the ones which are also obligatory for the professionals. You have to make sure in each case that the patient follows the correct order of the operations and the learnt processes.

Washing hands and using gloves

Hygienic hand wash is one of the most important rules. Hygiene-compliant hand wash, hand disinfection is needed before and after the palpation of the insertion gate of venous catheters, catheter insertion, replacement, reconnection, or any kind of touch *(B-evidence)*. Maintaining the aseptic technique is needed all through the time of catheter insertion, or replacement *(B-evidence)*. By washing hands the following can be reduced during interventions done with the hands: transmission of the infection from one patient to another, or from the very same patient's one body part to the other, or from a contaminated place, surface or object. Disinfection of the hands must be done at the interventions related to the use of equipment at the patient, care, examinations, before and after infusion treatment, with one of the approved hygienic disinfectants for the specified time of exposure. Washing hands and wearing gloves together can reduce the risk of transmitting microbes.

Disinfection of the equipment

The surface of the cannula or branule has to be disinfected before opening, before and after closing. Cannula stem/ stems, the spigot of distribution taps must be kept sterile after taken off (it is advisable to put it on the end of a sterile injection needle not taken out of its plastic sheath, store it covered with sterile gauze sheets). Replacement of the distribution taps is compulsory at the intervals recommended by the producer.

Disinfection of the work top, surfaces

Preparation of the infusion bottle, plastic bag, and the injection ampoule has to be done right before usage. If it might have got contaminated, it has to be disinfected after opening. Preparation for blending the nutritive solution and the other necessary products and the operation of blending can only be done on a disinfected working surface. For blending, only sterile, disposable equipment can be used. If the injection needle used for the suction of the solution touches the outside of the ampoule by accident, the needle has to be discarded and the operation has to be finished with a new, sterile needle.

Disinfection of the skin

Before inserting a branule, the skin surface has to be cleaned carefully with an antiseptic solution, securing the vein can be done only after the adequate exposure time (the drying time recommended by the manufacturer) *(B-evidence)*.

During insertion it is enough to use non-sterile gloves, with the restriction that after skin disinfection the site of the insertion must not be touched again (non-touch technique) *(C-evidence)*.

Use of sterile devices, materials

- Special infusion tubing
- Injection needles
- Mini spike
- Syringes
- Gauze sheet
- Distribution spigot

Checking points of parenteral nutrition

The parenteral nutrition plan contains the exact parameters to be checked, as well as the frequency of checks. There are, however, certain permanent rules of checking, which have to be done even outside the nutrition plan. Before and after the completion of parenteral nutrition, and on the first feeding occasion the following has to be checked every three hours: the patient's general condition, blood pressure, heart rate, temperature, blood sugar level, the quantity of excreted fluid, proper operation of the cannula, how the vein tolerates the dosing of the nutritive solution, proper function of the infusion pump.

Checking periods and parameters (care)

Checking periods in the first 1-3 months of permanent parenteral nutrition are every 2-3 weeks. In case of stably set parenteral nutrition a specialist consultancy is needed every 1-3 months, the aim of which is the assessment of the result of nutrition. The food and liquid balance diary recorded by the patient is essential for assessment.

Complications of parenteral nutrition

Complications of central venous cannula insertion
- Vain and tissue injuries
- Cardio-pulmonary injuries
- Lymphatic injuries
- Neurological injuries
- Mechanical injuries (pneumothorax)
- Infection, sepsis

Complications of peripheral venous branule insertion
- Hematoma
- Vascular pain
- Infection, sepsis

Complications linked to venous catheter usage
- Nutritive solution getting between the tissues paravasally
- Vascular catheter thrombosis
- Vascular catheter occlusion
- Air embolism
- Infection, sepsis

Metabolic disorders caused by the nutrition
- Glucose imbalance
- Water and electrolyte imbalance
- Acid-base imbalance
- Kidney dysfunction (kidney stone formation)
- Liver damage (cholestasis, cirrhosis)
- Blood clotting disorders
- Osteoporosis
- Metabolic complications

Circulatory disorders
- Fluid load
- Headache
- Breathing difficulties
- Stasis on the jugular vein area
- Increased blood pressure values
- Increased venous pressure
- Pulmonary oedema

Not well-planned, not well-considered nutrition strategies
- Overnutrition
- Undernutrition
- Pace of nutrition is too quick
- The quantity of nutrients is not adequate
- Feeding speed is too quick

Documentation

According to the level of care, the maintenance and the formal appearance of the documentation can vary, but substantive differences in the content cannot appear. In the practice of intensive care parenteral nutrition dependent patients are not self-sufficient, they often lie unconsciously respirated by a breathing machine. In each case they belong to the high-risk group. Maintaining the daily observation sheet makes it possible to record all the parameters of the patient, which are justified by his condition, monitored continuously for 24 hours.

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24. The Need to Urinate, Modified Urination

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Anatomical and physiological bases

The urinary system is responsible for participating in the regulation of fluid balance in the body. The unnecessary materials produced during cellular metabolism reach the urinary system by blood circulation and the urinary system excretes the completely harmful materials which are excreted from the body with the help of the associated drainage system. The system is also involved in blood pressure regulation, water and electrolyte homeostasis and in the maintenance of acid-base balance. The two kidneys belong to the urinary excretory organs, the urinary drainage system consists of the ureters, the bladder and the urethra.

The kidneys

The kidneys ('ren' in Latin, 'nephros' in Greek) are bean-shaped, reddish brownish paired organs located in the in the upper back section of the abdominal cavity, on both sides of the lumbar vertebrae in a retroperitoneal way. Compared to the left kidney, the right kidney can be found slightly lower due to the liver being above it. Both kidneys have an anterior and posterior surface, an upper and a lower pole, and a lateral and medial edge, the kidney gate, the renal hilum can be found by the latter.

The kidney is surrounded by a three layer capsule, as follows, starting with the innermost one: (1) the renal capsule, which is a fibrous capsule that directly covers the surface of the kidney; (2) the inferior renal capsule is the middle adipose capsule embedded into which the adrenal glands are located on the upper pole of the kidneys; (3) the superior renal capsule, which is the outer capsule.

Macroscopically the kidney can be divided into the outer cortex (renal cortex) and inner medulla (renal medulla). The renal medulla is followed by the cavity system of the kidney, which is lined with urothelium. The renal cortex is a few millimetres thick, inside of which the Malpighian corpuscles of the nephrons show typical granularity. The renal medulla starts with medullary pyramids from the renal cortex, the basal part of which looks toward the renal cortex and its apical part looks toward the renal cavity system. The papillae can be found on the tip of the renal pyramids, which contain the collecting ducts of the nephrons. The papillae are followed by the minor and then the major calyces and finally the renal pelvis, the continuation of which is the ureter leaving the renal hilum.

The basic anatomical and physiological components of the kidney are the nephrons, of which 1-1.5 million can be found in each kidney. The nephrons consist of the Malpighian corpuscle, which is composed of a glomerulus and the Bowman's capsule and is fully located in the renal cortex of the kidney, the proximal convoluted tubule, which can also be found in the cortex, the descending limb of the loop of Henle, the ascending limb of the loop of Henle, which run in the renal cortex and the renal medulla and finally the collecting duct, which is located in the renal medulla. Several nephrons can belong to one collecting duct. The functions of the nephrons are: filtration, reabsorption, excretion.

The kidneys receive their blood supply from the renal arteries which branch from the abdominal aorta. The vessel entering through the hilus, divides further into the so-called interlobular branches (according to the medullary pyramids), then out of these, arc-shaped arcuate arteries run through the boundary of the renal cortex and medulla. The iron afferents start from these, which lead the blood to the glomeruli, whereas the iron afferents leaving them ensure the blood supply of the nephrons as they move further along. As the veins follow the arteries, they gather into larger and larger branches and finally a renal vein exiting each kidney gate transports the used blood, rich in carbon-dioxide, into the inferior vena cava.

It is to be emphasized that juxtaglomerularly, where the iron afferents enter the glomeruli, their walls affect the wall of the distal convoluted tubules and there, when the amount of blood circulating in the vessels decreases, the so-called JGA cells ensure the secretion of the renin materials, which are involved in the regulation of blood pressure through the angiotensin-aldosterone system. Aldosterone is produced in the glomerular zone (outer) layer of the cortex of the kidney.

The ureter

As they exit the renal hilum, the ureters transport urine to the bladder. They are approximately 25 cm long and 5 mm in diameter, lined with urothelium and contain two layers of smooth muscle in their walls, retroperitoneally located formulas which diagonally drill the bladder through in its back, bottom part.

The bladder

The bladder (vesica urinaria) is located in the true pelvis behind the symphysis, subperitoneally and partly intraperitoneally, since the urinary bladder, which continually fills up with urine, and a section of which makes the peritoneum bulging, and by this, it becomes partly covered by it.

The upper third of the bladder is lined with urothelium inside, its lower third is smooth. Its wall is strengthened by three layers of smooth muscle, which is thus partly covered by the peritoneum and partly by connective tissue. The trigone of urinary bladder (trigonum vesicae), which is a triangular formula, can be found in the bottom third of the bladder. The ureters open to the bladder at its two rear corners, while the urethra starts from its lower corner. Since the ureters thread through the bladder wall diagonally, the orifice closes like a valve after a certain degree of fullness, preventing further transmission of the urine to the bladder this way. The wall of the urethra starting from the bladder is strengthened by an involuntarily functioning circular sphincter called m. sphincter vesicae, which is built up from smooth muscle. The initial section of the urethra is surrounded by the circular m. sphincter urethrae, which is made up of striated muscles and consequently it can function voluntarily.

Urethra

The female urethra is 3-5 cm in length, running parallel to the anterior wall of the vagina. This is a tubular structure starting from the bladder base, its wall is initially lined by urothelium, then by multi-layered cylindrical or cubical epithelium and finally by multi-layered non-hornifying squamous epithelium. In its wall there is smooth muscle (longitudinal and circular) in two layers. It is fixed to its surrounding environment by connective tissue. It opens to the external world between the labia minora pudendi.

The male urethra is 20-25 cm long, it is divided into three parts: the prostatic urethra (pars prostatica), which starts from the bladder and surrounded by the prostate gland, it is followed by the membranous urethra (pars membranacea), which is the section drilling through the pelvic floor muscles and in which the internal and external sphincter can be found, and finally the section called spongy or penile urethra (pars spongiosa), where the outlet ducts of the Cowper's glands open. The structure of its wall is the same as that of the female urethra. The outlet ducts of the ejaculatory ducts and the prostate gland open into the prostatic urethra section.

The salt and water homeostasis of the body

The salt and water homeostasis of the body can be divided into three parts: salt and water intake, their distribution between the given fluid spaces and salt and water loss.

The salt and water intake primarily occurs by fluid consumption and eating but water is also formed in the course of oxidation taking place in the cells of the body. The salt and water intake is regulated by the feeling of thirst, in the development of which primarily the osmoreceptors located in the hypothalamus and the volume receptors located in the right atrium and the large veins participate when the osmolality of the body fluids is increased and the blood volume is decreased. Hyperthermia and the dryness of the mucous membrane of the mouth also play a role in the development of thirst. The following factors are associated with stopping liquid consumption i.e. drinking: the retention time of respiration, gastro-intestinal wall tension, habitually consumed quantity of liquid.

Between each fluid space osmotic and hydrostatic pressures play a role in the salt and fluid distribution.

The primary form of salt and water output in the body is urinary output. Everything else, e.g. output via faeces, breathing is a secondary output. The main form of salt and water output can be divided into the following parts: the production of urine in the two kidneys, urine storage in the bladder and the emptying of the bladder i.e. urination.

Vizeletképzés

The nephrons, i.e. the functional components of the kidneys are involved in the production of urine. A nephron consists of two parts: the Malpighian corpuscle and the tubular system. The Malpighian corpuscle is made up of the glomerulus and the Bowman's capsule. The glomerulus consists of the afferent and efferent arteriole and a capillary tuft between the two sections. This is where ultrafiltration occurs, where the ultrafiltrate is pressed out of the glomerular capillaries to the Bowman's capsule. From the Bowman's capsule the filtrate then flows into the tubular system, which comprises: the proximal convoluted tubule, the straight section of the proximal tubule, the descending thin segment of the loop of Henle, the ascending thick segment of the loop of Henle, the distal convoluted tubule, the connecting segment and the collecting duct.

The daily volume of about 180 l of filtrate gets to the Bowman's capsule through the filtration surface. The filter surface is three-layered, the first layer of which is the endothelial cell line of the capillary, the second layer is a basal membrane and its third layer is constituted of the podocytes of the Bowman's capsule. Due to the functioning of the filtration surface the resulting filtrate is almost protein-free but it contains the soluble substances of blood such as: ions, glucose, amino acids, urea, uric acid, creatinine. In addition to these, hormones not connected to proteins and vitamins can also be found in the filtrate.

The filtration pressure, which presses the filtrate from the capillaries to the Bowman's capsule, is determined by the resultant of the hydrostatic pressure of the capillaries and the Bowman's capsule and by the colloid osmotic pressure of the blood plasma. The volume of the blood plasma flowing through the glomeruli divided by the filtrate volume gives the filtration fraction value, which is physiologically 0.2 in the human body. The other physiological parameter of renal functioning is the glomerular filtration rate, GFR, in the regulation of which atriopeptin can have a significant role.

Filtrate cleansing takes place from the Bowman's capsule to the end of the collecting duct, during which a variety of passive and active transport processes also occur. Water is typically reabsorbed by osmosis, urea is reabsorbed by diffusion, while various ions, e.g. Cl^- flow according to their electrochemical gradient. Certain substances e.g. Na^+, glucose, amino acids and albumins that got into the filtrate are typically absorbed in the course of primary, secondary, active transport processes and cytosis.

According to the bilateral membrane of the tubular cells the following typical processes take place in the proximal convoluted tubule:

Luminal membrane processes

- Na^+ reabsorption through the Na^+ channels, in the course of which Na^+ diffuses from a higher concentration filtrate to the lower concentration cell. Na^+/H^+ exchange through Na^+/H^+-antiporter.
- Glucose reabsorption through Na^+/glucose cotransporters. Two types of Na^+/glucose cotransporters (sodium-glucose transporter – SGLT1, SGLT2) can be found in the proximal convoluted tubule and in the straight section of the proximal tubule. In the luminal membrane of the proximal convoluted tubule cells SGLT2 can be found, which transports a Na^+ ion and one molecule of glucose. In the luminal membrane of the cells in the straight section of the proximal tubule there is SGLT1, which transports two Na^+ ions and one molecule of glucose. Both transporters transport the glucose and the Na^+ from the filtrate to the proximal convoluted tubule cells.
- Amino acid reabsorption occurs by amino acid/amino acid antiporters, Na^+/amino acid cotransporters and amino acid transporters during the operation of which amino acids get into the lumen of the proximal convoluted tubule cells from the filtrate.
- Phosphate reabsorption occurs by Na^+/phosphate cotransporters through which Na^+ and phosphate is transported from the filtrate into the cell.
- During albumin endocytosis the albumins that got into the filtrate get into the cells of the proximal convoluted tubule where they are broken into amino acids cell with the help of the lysosomes which can be found in the cells.
- During urea reabsorption the urea that got to the filtrate gets into the proximal convoluted tubule cells by diffusion.
- The reabsorption of water occurs through the aquaporin-1 ducts, part of the water content of the filtrate gets into the proximal convoluted tubule cells through these ducts.
- Additional Na^+, K^+, Cl^-, Ca^{2+} ions and water is reabsorbed back from the filtrate via paracellular pathways.
- During organic cation secretion, the organic cation (e.g. creatinine), which got to the tubular cells through the basolateral membrane is secreted into the filtrate from the tubular cells.
- During organic anion secretion, the organic anion (e.g. para-aminohippuric acid, i.e. PAH; drug derivatives e.g. penicillin, uric acid), that got into the tubular cells through the basolateral membrane is secreted into the filtrate from the tubular cells..
- During the operation of the K^+ duct, in the course of the functioning of the basolaterally located Na^+-K^+-ATPase pump, K^+ ions get into the proximal convoluted cells, part of which get into the tubular lumen from the lumen of the cells with the help of the K^+ duct.
- Ca^{2+} reabsorption occurs via the operation of the Ca^{2+} duct when Ca^{2+} ions flow into the inside of the proximal convoluted cells from the filtrate which is in the tubular lumen.

Basolateral membrane processes

- There is HCO_3 reabsorption by the functioning of Na^+-$3HCO_3$ cotransporters, during which the HCO_3 ions and some of the Na^+ ions get into the interstitial space from the proximal convoluted tubule cells.
- Na^+ reabsorption occurs by the functioning of the Na^+-K^+-ATPase pump, in which, during the luminal membrane processes, part of the Na^+ ions intake by the operation of the Na^+ duct, the Na^+/H^+ antiporter, the Na^+/glucose cotransporters, the Na^+/amino acid cotransporters and the Na^+/phosphate cotransporters get into the interstitium from the lumen of the proximal convoluted tubule cells, while parallel to this, K^+ ions get into the lumen of the cells from the interstitium. In the course of the process the exchange of three Na^+ ions and two 2 K^+ ions takes place, whereas by the operation of the pump Na^+ gradient is produced.
- During the operation of the Na^+-K^+-ATPase pump two K^+ ions get into the proximal convoluted cells, which get back to the interstitium from the lumen of the cell with the help of the K^+ duct.
- Glucose reabsorption occurs via glucose transporters, when the glucose that got into the tubular cells in the course of the luminal membrane processes, by the operation of SGLT1 and SGLT2, gets to the interstitium from the proximal convoluted tubule cells by the functioning of the glucose transporter (GLUT-2).
- There is amino acid reabsorption via amino acid transporters and amino acid / amino acid antiporters during which processes the amino acids get into the interstitial space from the proximal convoluted tubules.
- Organic cation secretion takes place, when, by the functioning of the organic cation transporter, the organic cation gets from the interstitium into the proximal convoluted tubule, which gets into the filtrate through the luminal membrane.
- Organic anion secretion occurs when, during the operation of the Na^+/organic anion cotransporter and the organic anion/organic anion antiporter, organic anion (e.g. dicarboxylate-α-ketoglutaric acid-α-KG) gets from the interstitium into the lumen of the proximal convoluted cells and then to the filtrate by the luminal membrane processes.
- The reabsorption of water takes place via aquaporin-1 ducts, during which the water that got into the tubular lumen gets into the interstitium.

- Ca^{2+} reabsorption occurs by the functioning of the Ca^{2+} pump and the Na^{+}-Ca^{2+} antiporters, in the course of which processes the Ca^{2+} ions that got inside the cells get into the interstitial space.

The descending thin segment of the loop of Henle is of high water permeability due to the aquaporin-1 ducts that can be found both in the luminal and basolateral cell membranes, where water reabsorption takes place. There is no active transport in this section, therefore it is a passive element.

The ascending thick segment of the loop Henle is impermeable to water because there are no water ducts in the luminal membrane, however, additionally a significant degree of Na^{+} and Cl^{-} ion reabsorption occurs via the operation of the Na^{+}-K^{+}-$2Cl^{-}$ cotransporter through the luminal membrane and then the output of the Na^{+} and Cl^{-} ion intake takes place through the basolateral membrane by the functioning of the Na^{+}-K^{+}-ATPase pump and the Cl^{-} duct. The filtrate in the tubular lumen becomes hyposmotic in this section. That is why the ascending thick segment of the loop of Henle is also called "diluting segment". Via paracellular pathways additional Na^{+}, K^{+}, Ca^{2+} and Mg^{2+} ions are reabsorbed back from the filtrate.

In the distal convoluted tubule typically Na^{+}, Cl^{-} ion, Ca^{2+} and Mg^{2+} reabsorption takes place by the following luminal membrane processes: Na^{+}-Cl^{-} cotransporter, Ca^{2+} duct, Mg^{2+} transporter operations. The ions which got into the tubular cells get into the interstitium by the functioning of the following ducts and transporters through the basolateral membrane: Na^{+}-K^{+}-ATPase pump, $3Na^{+}/Ca^{2+}$ antiporter (the functioning of which is increased by the resulting cAMP that comes into being after its having bound to the receptors of the parathormone) and Ca^{2+} duct (the operation of which is increased by the resulting $CaBP_9$ that is produced as a result of its binding to the basolateral membrane receptors of vitamin D_3), by the functioning of the Cl^{-} duct, Mg^{2+} transporter and Na^{+}/Mg^{2+} antiporter.

In the collecting duct section two types of epithelial cells are differentiated, namely the principal or collecting duct cells and the intermediate cells (α and β). In the principal cells typically Na^{+}, Cl^{-} ion and water reabsorption takes place. The ions access the inside of the cells through the luminal membrane, Na^{+} and Cl^{-} ducts, whereas water gets into the cells via aquaporin-2 ducts. The Na^{+} duct is stimulated by aldosterone, after it has bound to its intracellularly located receptor. The aquaporin-2 duct is not a permanent part of the luminal membrane of the principal cells, antidiuretic hormone (hereinafter referred to as ADH) is required for it to appear there. After its binding to the hormone binding receptor of V2, which can be found in the basolateral membrane, ADH enhances the wandering of the aquaporin-2 ducts containing vesicles to the luminal membrane, which merge with it and the aquaporin-2 ducts get into the cell membrane. This way water gets from the filtrate, which can be found in the tubular lumen, to the inside of the collecting duct cells through the ducts. Through the basolateral membrane the ions and water reach the interstitium by the following processes: by the operation of the Na^{+}-K^{+}-ATPase pump, Cl^{-} ducts, aquaporin-3 and aquaporin-4 ducts.

Typically H^{+} secretion takes place by the functioning of H^{+} transporters and H^{+}-K^{+} antiporters and also HCO_3 reabsorption by the operation of Cl^{-} -HCO_3 antiporters in the α-intermediary cells of the collecting duct. Whereas in the β-intermediary cells of the collecting duct H^{+} secretion typically occurs by the functioning of H^{+} transporters and HCO_3 secretion takes place by the operation of Cl^{-} -HCO_3 antiporters.

Vizeletelvezetés

From the collecting ducts of the kidney the urine gets into the renal pelvis through the renal calyces and then into the bladder through the ureters. The ureters reach the bladder diagonally, that is why the openings close when the bladder tightens, so urine cannot flow in a reversed direction. The bladder capacity is about 300-500 ml, which can reach a volume of 800 ml in a highly strained state. A stimulus to pass urine occurs in case of 150-200 ml of urine, which can still be voluntarily suppressed. The bladder is characterized by stress relaxation, in the course of which pressure does not increase significantly even in case of getting filled, due to the relaxation of the smooth muscle cells, which is started by tightening. The stimulus of the distension-sensitive receptors of the bladder is delivered to the spinal cord by the pelvic nerve and after the processing of the stimulus it runs back to the periphery in the pelvic nerve, as a result of which the detrusor muscle and the musculus sphincter vesicae contract, thus urine is excreted through the opening entry of the urethra.

The need to pass urine

Urine secretion and drainage are parts of basic human needs. In Maslow's hierarchy of needs it constitutes a part of physiological needs. In Virginia Henderson's nursing model, which is based on vital functions, the secretion of urine is listed as the evacuation of the waste materials of the body. In Nancy Roper's model the evacuation of stool and urine are one of the 12 basic needs. In Dorothea Orem's nursing model, which is based on the lack of the ability of self-care, the management of evacuation processes is listed in the fourth place among the general self-care requirements. Passing urine is the basis of health and well-being.

Nurses must observe whether the factors influencing urine secretion are present regarding the patients. These can be as follows:

- Age-group characteristics: the voluntary regulation of passing urine does not develop until the age of one and a half to two years, urine storage ability depends on the capacity and elasticity of the bladder. Due to their motility disorders, old individuals may evacuate urine harder than the physiological process.
- The condition of the muscle tone (musculature of the abdominal wall or the pelvic floor): the weakening of these muscles may lead to dysfunction in the ability to hold urine, which result in the appearance of incontinence.
- Some diseases are: e.g. diabetes mellitus syndrome, which may be accompanied by polydipsia that results in polyuria, or compensatory polyuria (by which the kidney ensures the secretion of toxins), that can also be detected at the initial stages of chronic kidney diseases.
- Surgical interventions: e.g. anaesthetics, analgesics reduce filtration and thereby urine secretion as well.
- Medicines: e.g. diuretics (they increase the amount of urine output); alpha receptor agonists (they cause urethra constriction and urinary retention mainly in males); alpha receptor antagonists (they relax urethral muscles and cause decreasing urethral resistance); anticholinergics (they may cause urinary retention with post-void urine dribbling symptoms, faltering urinary flow and overflow incontinence); beta receptor antagonists, calcium duct blockers (they induce urine retention); antipsychotic drugs, sedatives (they cause retention by inducing the relaxation of the detrusor muscles).
- Psychological factors: e.g. stress may increase the frequency of urination, it may cause the urge to urinate due to affecting the sympathetic nervous system.
- The quantity and quality of fluid intake: e.g. caffeine and alcoholic beverages increase the secretion of urine because alcohol inhibits ADH (antidiuretic hormone) effects.
- Diagnostic examinations: e.g. hypersensitivity reactions after intravenous pyelography or muscle spasms after cystoscopy may inhibit passing urine.

The differences in urine volume

1. *Daily urine evacuation (diuresis):* in adults with average body weight the daily urine volume is 1 ml / hour / body weight kg, that is, the average amount varies between 500 to 2400 ml in case of average fluid intake and nutrition. In adults, the stimulus to urinate appears after 250 ml of urine has reached but the bladder of a healthy individual can hold 400 to 500 ml of urine without any problems. Its amount is influenced by fluid intake, diet, certain medicines e.g. diuretics, non-renal fluid loss (vomiting, diarrhoea, sweating), the temperature of the environment, fever and physical activity.
2. *Frequency of urination (polyuria):* the daily urine volume exceeds 2500 ml. It may be caused by e.g. excessive fluid intake, compensatory polyuria, diabetes mellitus, diabetes insipidus, diuretics.
3. *The reduction of the amount of urine (oliguria):* the daily urine volume ranges from 100 to 400 ml. It can be caused by dehydration, kidney failure, oedema formation, urinary tract obstruction, increased production of ADH.
4. *The interruption of urine secretion (anuria):* the kidneys either do not secrete urine or only in small amounts. The daily urine volume is below 100 ml. It can be caused by prerenal, renal or postrenal reasons. In prerenal cases the renal blood flow and filtration pressure decreases, which is the result of shock, acute myocardial infarction or dehydration. Renal causes include the diseases of the kidney. Postrenal causes are traced back to the obstruction of the ureters and the urethra, their stricture (due to the presence of stones or tumour). Reflexive anuria may occur, in case of which one of the ureters is obstructed by stones and due to that, the patient's pain is excruciating. Due to the effect of reflexes the smooth muscle vessels of the contralateral kidney and the ureter are contracted, so the produced urine cannot evacuate. When a patient has oliguria or anuria, checking the following issues is required: If the patient has a permanent catheter, checking whether there is a blockage in the lumen of the catheter or if there is twisting, if the bladder catheter is in the right place (e.g. not in the vagina). Other problems may also occur, such as hypovolaemia, side effects of medicines, obstruction, cardiovascular causes.
5. *Urine dribbles in case of overfilled bladder (ischuria paradoxa).* The kidneys secrete urine but it cannot empty from the bladder. The internal bladder pressure continually increases and as a result of this urine is evacuated in dribbles but the bladder remains full.
6. *Nycturia (i.e. nocturia):* frequency of urination at night. Nycturia is common in case of cardiac and renal failure, maltreatment of diabetes, diabetes insipidus or if the kidneys cannot concentrate the urine. Frequent small amounts of urination may also occur in case of prostate hypertrophy.

Micturition problems

Micturition problems may be acute or chronic, they may be accompanied by qualitative or quantitative disorders. The main problems include *lower urinary tract infections, incontinence, dysfunctional urination and urostomy.*

Its forms are as follows

Urine retention (urine stagnation, urine obstruction): the lack of voluntary urination is known in an acute or chronic form (the kidneys secrete urine but the evacuation is inhibited). Its acute form is accompanied by an excruciating stimulus to urinate. Its chronic form is painless and it is accompanied by increased residual urine volume. It may be caused by disorders of infectious, inflammatory origin (e.g. prostatic abscess, prostatitis, acute vulvovaginitis, vaginal pemphigus, Guillain-Barre syndrome, Lyme disease, urethritis, herpes simplex virus infection, cystitis, abscess around the urethra). Obstructive disorders (e.g. benign prostatic hyperplasia, phimosis, malignant tumour of the prostate, abnormal formations of the mi-

nor pelvis, such as malignant gynaecological tumours, pregnant uterus bending backwards, cystocele, rectocele, uterine prolapse). Neurological causes (e.g. cerebral vascular diseases, brain bruises, multiple sclerosis, Parkinson's disease, tumours, spinal cord injuries, spinal cord vascular diseases, intervertebral disc diseases, spina bifida occulta, involvement of the peripheral nerves). Pharmacological causes (e.g. alpha adrenergic agonists, antagonists, beta adrenergic drugs, anticholinergics, antipsychotics. See their impact at the part on factors influencing urine evacuation. (In a post-operative period the side effects of painkillers, sleeping pills and anaesthetics are in the background of urinary retention.) Other causes are (e.g. penile injury, the last trimester of pregnancy, post-natal complications, disorders of the urethral sphincter, traumas of the minor pelvis, psychogenic causes). In case of acute urinary retention immediate catheterization is necessary, so that the bladder can be released from the pressure. Hypotension, haematuria, post obstructive diuresis may develop as rapid decompression complications. In addition to considering the risk of these complications, fast bladder evacuation must be strived for. In case long-term catheterisation is necessary, use urinary catheters impregnated with silver alloys because urinary tract infections occurs less frequently upon their application than when standard urine drainage devices are used.

The causes of urinary retention include obstructive, infectious, inflammatory, neurological, pharmacological and other reasons.

The symptoms of urination disorders

1. *Storage problems* (e.g. nocturia, different types of incontinence)
2. *Emptying problems* (e.g. hip, painful or difficult urination / dysuria/; frequent urination /polakisuria/; delayed urination; change in the urination stimulus: urgency, urinary flow alterations: its weakening, disruption, urination only starts as a result of strong abdominal pressure or inability to urinate).

Lower urinary tract infections:

In the course of the lower urinary tract infections pathogenic organisms settle in the lower urinary tract and they induce inflammatory changes. Based on their aetiology they may be caused by bacteria and fungi (in case of Candida infections, the examination of women's vaginal discharge is justified). The urinary pathways are physiologically sterile, but when passing urine, the urine is contaminated by the uropathogenic bacteria present in the perineal area and the pathogens become predominant. Its clinical manifestations are asymptomatic bacteriuria, cystitis, haemorrhagic cystitis (pyelonephritis does not belong to the lower urinary tract infections). The paramedical team members also must be clear about the quality of the symptoms. The symptoms of asymptomatic bacteriuria: there are no clinical symptoms and after urine specimen has been taken, 10^5 germ count / ml pathogens can be bred. The symptoms of cystitis: dysuria, with or without urinary incontinence, fever, elevated temperature, polakisuria. Haemorrhagic cystitis: dysuria, with or without urinary incontinence, fever, elevated temperature, polakisuria, macroscopic or microscopic haematuria. For making a diagnosis urine specimen is needed, which can be obtained in the following ways:

- Midstream clean catch urine specimen
- Intermittent catheterization for diagnostic purposes
- Taking urine samples from patients with a permanent catheter
- Urine specimen gained with bladder puncture
- Specimen obtained from a disposable adhesive bag (e.g. in case of infants)

The lack of the ability to hold urine

The loss of control over urination. According to the International Continence Society (IAC) it is: involuntary loss of urine through the urethra, which occurs at an unexpected place and time and thus causes social and hygienic problems. The female urinary incontinence is common, in Hungary an estimated 300,000 to 500,000 women suffer from this disorder. Based on the description by the International Incontinence Society several types of it are distinguished.

Urinary incontinence

Urinary incontinence was already an established problem in ancient times. In the Ebers Papyrus, which has been left to us since 1500 B.C., we can read about this disorder. Hippocrates gives both a symptomatic diagnostic descriptions on this problem of urine. storage.

Incontinence is not a disease but a symptom with underlying anatomical physiological deviations that are accompanied by continuous or intermittent complaints of incontinence.

It is primarily the task of general practitioners to find incontinent patients, since they know their clientele thoroughly within their practice and during the doctor-patient encounters they can ask their patients with risk factors about complaints concerning urination. After having performed the basic tests it is their job to direct the patients in question to specialists (urologists, gynaecologists).

Regarding incontinence, elderly people, obese individuals, mothers during pregnancy or after childbirth, patients with diabetes and patients who have undergone urinary or genital surgery are the ones who are subjected to an increased risk of incontinence.

The detection and treatment of incontinence is essential because it may lead the patient to social isolation.

Surveys have shown that incontinence causes more significant problems in patients' lives than cerebral blood supply disorders, limited physical mobility, recurrent infections, chronic respiratory failure and diabetes.

Supplementary diagnostic tests in case of urine incontinence

They are to be performed in case the required and recommended tests do not provide an accurate diagnosis. (Wyman, 2000; Hay, 2001; Noble, 1976; Kegel, 1948; Sand, 1995, Wise, 1993; Matányi, 2003)

- Urethra pressure profile (UPP) test
- A graphical representation of the urethral closure pressure
- Valsalva Leak Point Pressure (VLPP): It represents the abdominal pressure value at which urine leakage begins. Under the value of less than 60 cm water the inducing reason is urethral sphincter dysfunction, over 90 cm water anatomical deviations (e.g. vaginal prolapse) cause symptoms of incontinence.
- Urodynamic testing of the urine
- Urethrocystoscopy
- The endoscopic tests allow the urinary tract to be directly viewed. These tests are applied not only for diagnostic but also for therapeutic purposes because various devices (e.g. urinary stents: ureter catheters, forceps, suction tubes, etc.) can be led through their working channels.
- Imaging examinations (abdominal ultrasound, cystography, transvaginal ultrasound)

Using this information, invasive, *surgical treatment comes next.*

In case incontinence is complicated (e.g. painful loss of urine, haematuria, recurrent urinary tract infections, radiation of the minor pelvis, vaginal prolapse), the special tests are performed immediately.

Urodynamic tests

They include all types of tests that serve the purpose of distinguishing between stress and urge incontinence.

- Uroflowmetry: it is a non-invasive test that determines the amount of urine voided per time unit and its flow unit. The maximum flow speed (also known as Q max.) is used to determine the degree of obstruction. It is an informative test because it indicates abnormal urine evacuation but it does not reveal its exact cause. The maximum urinary flow rate, which is 15-25 ml/sec for males and 20-30 ml/sec for females, is an important parameter of the test.
- Cystometry: it measures the filling phase of the bladder (bladder pressure measurement). The purpose of the examination is to exclude detrusor hyperactivity and to determine bladder compliance (bladder capacity). Under 20 ml/cm water compliance is decreased and under 10 ml/cm water it is extremely low. It is indispensable for diagnosing urge incontinence.
- Pressure - flow test: it examines the emptying phase of the bladder. This test is necessary in the case when urine flow is weak. After having filled the bladder, the patient urinates with the measuring catheter in the urethra, so the intervention indicates the contractility of the bladder.
- Carrying out the leakage test is a non-invasive method of testing: it shows the storage capacity of the bladder and the functioning of the sphincter. The amount of the loss of urine can be determined from the weight of the incontinence pad (the incontinence pad is measured before and after use) or from the volume of urine voided into the collecting bag. The dribble test can be performed not only at rest (normal daily activities), but also during occurrences accompanied by abdominal pressure (coughing, sneezing). The results are given in grams or ml/hour.

The indications and methods of urine tests

Urine test indications

- The patient complains of urination problems (the qualitative and quantitative composition of his urine has changed).
- The patient has known chronic diseases such as diabetes mellitus syndrome, chronic kidney disease (renal oedema), hypertension
- The patient has pain in the minor pelvic, abdominal area
- The patient has had a high temperature for several days and it has no detectable reason. As part of nodule detection.
- As part of screening (secondary prevention), e.g. the detection of sugar, blood, pus in the urine
- The infection of the urinary tract is suspected
- As part of surveillance activities (testing and cultivating the urine of patients who are in a bad general condition)
  - In case of urogenital mycoses
  - The detection of mycobacteria (the patient collects a 24-hour urine for three consecutive days, which specimen is taken from)
  - The detection of trichomonas vaginalis

Indication areas of urine testing

- Screening
- The process of making a diagnosis (history, symptom assessment tests, charts, physical examinations, urinary diary, etc.).
- Monitoring disease statuses

Testing the characteristics of urine

The examination of urine is performed with macroscopic (physical, chemical) and microscopic methods.

Macroscopic urine tests

Testing the physical properties of urine and chemical procedures are included in this group. The macroscopic examination of urine is the direct, visual observation of urine, during which the physical characteristics of urine, such as its colour, transparency (turbidity) and specific gravity can be evaluated. The presence or absence of compounds can be tested from the specimen during the chemical analysis.

The colour of urine:

- Consumed food
- Drugs, medicines
- Diseases, abnormal conditions

The determination of the colour of urine is not new, its regular checking was also recommended by Protosharis in the 7th century. Physiologically the urine is yellow or amber.

The transparency of urine can be easily determined if urine is in a test-tube or a flask. Physiologically the sample is transparent. It becomes cloudy, murky in case of phosphate precipitation, in the presence of bacteriuria, leukocytes and also in case of pyuria and microscopic haematuria.

The smell of urine

The smell of fresh urine is aromatic but not unpleasant, its colour is straw-yellow. In time its colour may become cloudy due to the crystallization of salts, in which case the smell is also changed: it becomes unpleasant, with a pungent smell of ammonia, which is attributed to the decomposition of carbamide.

Urine has an unpleasant ammonia smell physiologically as well, the longer the smell is concentrated the stronger it gets. In case of untreated diabetes mellitus syndrome it will smell like acetone, in case of very little fluid intake it will smell like ammonia. In case of untreated phenylketonuria an infant's urine will have a mouse (musty) odour.

Quantity tests

Measuring the quantity of urine

The measurement of urine can be done in several ways. In case of a properly co-operating patient with a clear consciousness, whose urine quantity does not need to be specified with ml accuracy due to his underlying disease, the amount can be asked about before the morning doctor's round and it can be written on his hospital chart. If the type of the underlying disease necessitates an accurate measurement, it can be performed in a 4-hour, 8-hour, 12-hour, 16-hour or 24-hour interval (e.g. adrenocortical hormone level, creatinine clearance determination). The given period always begins with the patient's urination and collecting urine starts after that. The nurse indicates the start time on the container and on the laboratory notification. Extra attention should be paid to avoid faecal contamination of urine. In case of an outpatient, or a patient who can walk, the urine collection container is placed in the forefront of the toilet and it must be labelled for the patient's identification. In the case of a patient who is confined to be urine should not be left in the hospital room. The result of a 12-hour urine collection has to be recorded separately in the night and daytime column of the hospital chart. Urine collection in infants is performed with the help of a disposable plastic bag, made of self-adhesive material, which must be fixed onto the urethral opening.

Measuring the intake and emptied urine volume

The amount taken in does not only include the fluid content of the orally consumed food and beverages (e.g. soup, water, nutrition given via feeding probes), but the amount of fluids administered parenterally must also be included (e.g. infusion, transfusion, parenteral nutrition).

The emptied amount includes urine, faeces, vomit, sputum, sweat, fluid evacuated through probes and drains and also perspiration fluid loss.

Various documents that are part of the nursing documentation, such as liquid charts, urination diaries can be used for fluid intake and output measurements. More information is given on nursing documentation and different nursing charts in the chapter titled "Critical thinking in nursing".

In the course of their daily work nurses should keep paying attention to the existence of complaints associated with urination e.g. dysuria, the functioning of the bladder sphincter, whether there is dribbling, urinary incontinence, how much the daily urine volume is, what the colour, the smell, transparency and content of the urine is.

Urine sampling forms

The produced urine is considered physiologically sterile. In all cases urine specimen must be collected by applying aseptic techniques while keeping the rules of sterility.

The most suitable sample for urine testing is the first morning urine, in which the number of bacteria is the highest. If a urine sample collection is performed later during the day, urine should be stored in the patient's bladder for at least three hours prior to taking the specimen. A urine test must be carried out before starting an antibiotic therapy. (Pratt, 2006; Grout, 2006)

Identification and storage of urine specimens

The following information must be indicated on laboratory accompanying documents: the patient's personal data, social security number, disease diagnosis, sampling method (midstream clean catch urine, first-stream urinary flow, urine collection from catheters, urine obtained via supra-pubic aspiration), sampling time, whether the patient receives any antibiotic or diuretic therapy.

Urine samples stored at room temperature must be forwarded to a laboratory within one or maximum two hours. If this is not possible, urine can be stored at +4°C for 24 hours. If the urine cannot be processed within the given time interval, it is possible to use culture medium, which inhibits the growth of pathogens.

The application of the Uricult system allows the bedside diagnosis of bacterial urinary tract infections. Uricult is a disc, both sides of which is covered by culture medium. One side is green, this ensures the growth of bacteria in a positive case, the other side of the disc is of two colours, red and colourless. The red culture medium selectively ensures the growth of Gram-negative intestinal bacteria, while on its colourless part enterococci can form red colonies.

Urine sampling and transportation recommendations

All urine collection and/or transport containers should be kept clean.

During collection and/or transportation the lid must be securely closed. Leak-proof containers protect healthcare workers from the risk of infections and the specimen from contaminants.

Collection and transport containers must be made from break-resistant plastic.

Specimen containers must not be re-used.

Their appropriate labelling is indispensable.

In the course of microbiological examination of urine the use of chemical preservatives is recommended, if the sample cannot be processed within 2 hours. Otherwise, these samples should be stored refrigerated at 2-8 °C.

High-quality tests to promote diagnostics

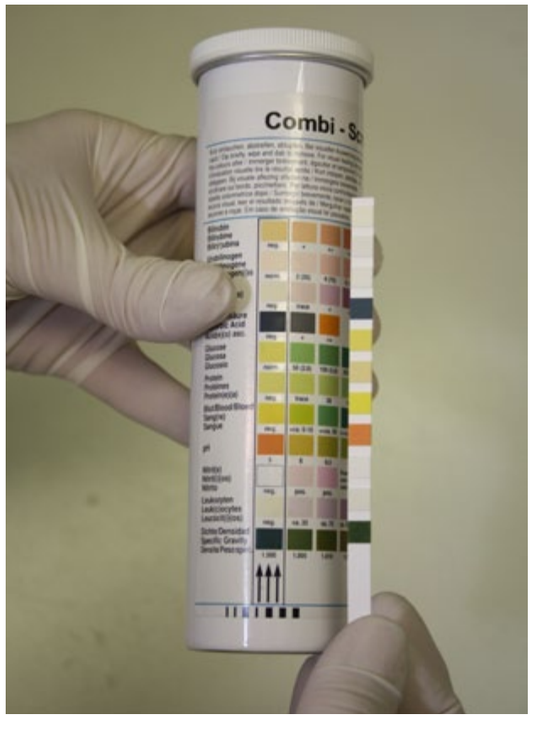
Urine dipstick chemical analysis *(Picture 4)*

Urine dipstick chemical analysis provides qualitative and quantitative results about some of the components of urine. The dipsticks are usually suitable to determine 9, 10 or 11 features. A dipstick designed for the determination of 9 features is suitable for testing the following components: urobilinogen, bilirubin, ketones, blood, protein, nitrite, glucose, pH and ascorbic acid (vitamin C). A dipstick suitable for determining 10 characteristics is supplemented with testing the following components: leukocytes, specific gravity, however, ascorbic acid is not tested with them. Dipsticks testing 11 features include the testing of leukocytes, specific gravity and ascorbic acid. However, it is important to note that the tested components may vary by different manufacturers. Fresh urine, collected in dry containers required for the use of urine test dipsticks. Urinalysis must be performed within one hour of collection. In case of longer sample storage, the bacteria may multiply and this may affect the quantitative values of pH, nitrite, glucose and blood. The evaluation of the dipsticks may be carried out visually or with devices.

Picture 1. Different urine dipsticks

Visual evaluation:

Dipsticks (thin, 5 mm wide plastic strips) are impregnated with reagents and then dried. The dipstick has to be held in the urine specimen briefly (10-15 sec), then it must be pulled along the container wall in order to remove the excess urine. While held horizontally, the chemically impregnated squares on the dipstick have to be compared with the colour scale on the side of the plastic bottle (Picture 5). The reading time is 1-2 min after dipping but the pH and the protein level results are valid within 60 sec. However, it must be known that after two minutes diagnostic significance cannot be attributed to the colour changes. The evaluation of the results may be affected by several factors (e.g. specific gravity, the lighting of the room, the expiration date of the reagents). The dipsticks are disposable, they are to be stored at room temperature, protected from light, air-tight, in their original packaging. If the surface of the dipsticks shows discolouration, or is darkened, this is a sign of the decomposition of the additive substances. In this case the dipsticks must not be used.



Pictures 2. Visual evaluation

Picture 3. The determination of specific gravity

Specific gravity (sp gr) *(Picture 3)*

Monitoring urine osmolality, the concentration of the solutes (ions) present in urine. It gives information about the kidney's diluent and concentrating ability. Healthy kidneys can change the specific gravity of urine between 1001-1030 g/ml. Its measurement is performed with the help of a measuring cylinder and measuring stick (urometer) or with reagent dipsticks. Specific gravity below 1007-1010 is the result of increased fluid intake. If specific gravity does not increase above 1022 after a 12-hour starvation and restricted fluid intake, there is an underlying case of generalized kidney damage or nephrogenic diabetes insipidus. In case of findings over the value of 1035, severe untreated diabetes mellitus syndrome or intravenously administered radiological contrast agents should be considered. Hyposthenuria is the decreased concentration ability of the kidneys. Asthenuria, isosthenuria are the termination of the concentrating ability of the kidney. During measurement with a urometer, it is important that the urine poured into the measuring cylinder is not foamy and the measuring stick should not touch the cylinder wall when it is placed (spun) into the urine.

Alkalinity (pH) *(Pictures 10, 12)*

Depending on the acid-base balance of the body, the pH of urine can vary from 4.5 to 8.5. In the case of normal, mixed diet its pH is slightly acidic. If its value is clearly alkaline, it is caused by the urea-degrading enzymes in the urinary tract, which are signs of bacterial infection. The acidic pH of urine inhibits the growth of bacteria present in it. It is determined by using indicator papers or dipsticks containing reagents. On the plastic dipstick pH 5 is indicated by light green colour that can vary up to the value of 8.50, which is indicated by bluish-green colour.

Pictures 4. a, b. The determination of pH

Microscopic tests

In clinical practice, microscopic urinalysis can be performed at a laboratory or with a diagnostic stix. The first morning specimen is the best for urinalysis. The required minimum amount is 10-15 ml. You must pay attention whether there is menstruation, local inflammation or any urethral injury involved. Mid-stream urine collection should be done.

Devices suitable for urine storage and transportation

Urine collection cup:

Lids of urine collection cups can be completely smooth or with integrated sampling ports. When the latter is used, the infection rate of the staff is of lesser degree because the special port allows urine sampling in a closed system (in vacuum tubes). There is vacuum in the sampling tubes and analogously to blood sampling with vacuum tube tests, the required amount can be drawn into them.

Urine (as well as other human secretions) is considered a potentially infectious substance. Some systems allow a closed system, which provide hygienic management and delivery of the sample.

Urine collection cups with snap-on, screw-on caps:

Upon the very first twisting of the cap, the perforation tape splits. *(Picture 5)* Once the screw cap is removed from the system, it is no longer considered sterile.

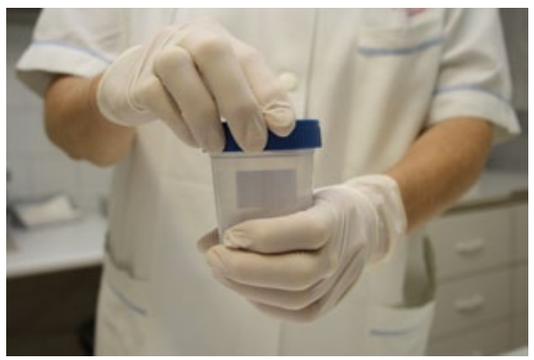
After having put the sample into the cup, first the cap has to be snapped on the cup and then tightly twisted onto it. *(Picture 6)*

Urine collection tubes:

Urine collection tubes are also available for the transfer and testing of samples, the tubes are free from additives or contain preservatives.

Preservatives help to stabilize samples until they are tested. If the tubes contain preservatives (boric acid), preservation time at room temperature is 48 hours. The tubes are leak-free and can be safely transported. Their fill volume is 8 to 15 ml. Urine gets into the test tube with the help of a transfer device. The urine sampling device (transfer device) has to be inserted into a sterile, capped cup and then pressed together as it is done with droppers.

Picture 5. Urine collection cup



Picture 6. Closing a urine collection cup

Urine collection tubes have two main types:

- Round-base tubes – the specimen is used for chemical testing.
- Conical-base tubes – suitable for microscopic testing (sediment test) because the cone shape allows centrifugation.

Urine collection cup with safety closure (plug):

The product is made of polypropylene, it is unbreakable and resistant to chemical damage. Most of them have a ml graduation.

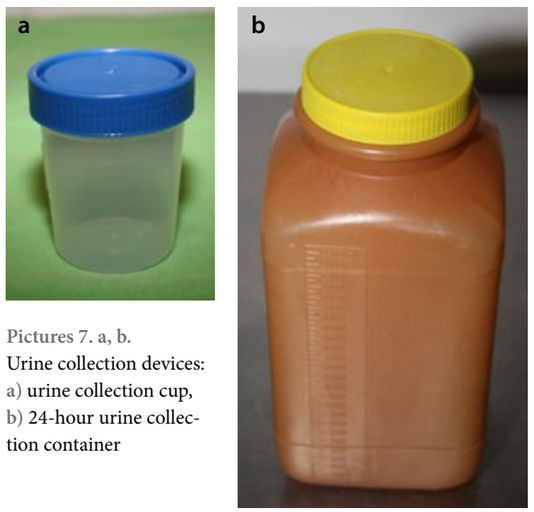
The urine specimen can be obtained from the collection cup in a way that the risk of contamination is minimized in the meantime, since a closed system is being created (the lid of the urine collection cup should be left on the cup while filling the test tubes).

As a first step, the urine transfer device has to be transpierced through the cap opening. The urine test tube must be inserted into the transfer device so that the required sample can get into the tube (the vacuum present in the system will automatically suck up the required amount of urine from the cup). As soon as the appropriate amount of sample is in the tube, the tube can be removed from the device and then the transfer device must also be pulled out through the lid opening.

The tube filled with the received urine sample must be labelled with the patient's information and transferred to the laboratory.

The means of urine collection and transport

Urine collection cups *(Picture 5)*
Urine collection cups with snap-on, screw-on caps
24-hour urine collection containers *(Picture 6)*



Pictures 7. a, b.
Urine collection devices:
a) urine collection cup,
b) 24-hour urine collection container

Urine collection container:

A 24-hour urine collection is carried out into a urine collection container, which is hygienic, prevents unpleasant odours from spreading and its closure is safe.

The urine specimen from the container can be sent for testing in a sterile specimen collection cup (urine collection cups with snap-on, screw-on lids) or a sterile test tube.

The inlet diameter of the 24-hour urine container is 7 cm, so that an easier sampling and sample ingestion can be arranged. It is provided with a drip ring, so, if the staff pours urine out of the container, it will not drip or flow on the device. Its colour is amber, which has the advantage that light does not affect the urine. This way, light-sensitive substances, such as UBG or porphyrin that can be found in urine may also be tested. Its volume is 2.7 to 3 litres.

When adding a preservative (hydrochloric acid, boric acid, acetic acid and toluene) is required due to special testing, appropriate labels must be placed on the container.

Urine preservatives and other preservatives

Based on NCCLS (National Committee for Clinical and Laboratory Standards) recommendations urine sample testing must begin within two hours of collection. However, this time can be extended by cooling the urine or by adding chemicals (preservatives). The most common urine preservatives are tartaric acid and boric acid, which make urine preservation possible also at room temperature and their reliability is similar to the urine being refrigerated (storage time varies from 24 to 72 hours). The range of preservation can be extended by preventing urine decomposition and bacterial overgrowth. Boric acid may be added to urine in the form of tablets, powder or in a lyophilized form.

Non-additive tubes do not contain chemical preservatives.

Promoting urine capture and drainage with special devices

Urine capture devices:

In case of various diseases, health conditions and prescribed bed rest (e.g. after lumbar puncture) the patient's emptying needs must be assisted by nurses. If possible, disregard catheterization when the needs of emptying must be met and use devices suitable for non-invasive urine capture.

Devices suitable for urine capture are as follows:

- Bedpans (Picture 59) and bedpan frame
- Urinals (male, female)
- Nappies, underwear nappies
- Urine pads

Picture 8. Plastic bedpan

Picture 9. Male urine containers: plastic male urinal

Male urine bottle with lid *(Picture 8)*

An important element of men's voiding urine to a urine container is the length of the penis. There is special underwear made for men, where the seam is sewn in a way that they can urinate in a sitting position as well.

A standard male urine collection container typically has a closure cap, which prevents its content to be spilt and it has a wider base so that it is more stable when placed between a male patient's legs and it does not tilt when put next to the bed.

Urinal with a valve to prevent spillage:

The rubber sheath on the neck of the bottle perfectly fits the penis and the closure valve prevents spilling.

Plastic *disposable* urinal, which is easy to transport in a pocket or a bag.

Gooseneck urinal

A gooseneck urinal is useful if the patient's passing urine is with difficulties due to developmental disorders, or if his penis is short or mutilated, since in this case standard urine containers would be difficult to use. The entire penis and also the scrotum can fit in the bottle without the urine being spilt from the system.

Female urinals *(Picture 10)*

Several devices have been developed over the last 10-15 years for solving female urinary incontinence, urinary problems. Research data suggests that the position taken during urination influences usability the most. The anatomically shaped contact interface of female urinals allows for a close fit with the labia majora and the urethral opening. The containers for capturing urine are portable or urine collection bags can be mounted to them. The female urinals are made of metal or plastic. (Fader 1997)

A urinal can be used by itself with a urine collection bag attached to it. This device can be placed between a female patient's legs, who can sit on it. It is useful for patients in wheelchairs, because the U-shaped part can be placed between the legs and then pushed under the ischium. The system ensures the separation of the thighs and thus hygienic urination as well.

The *pan-type urinal* is a shallow plastic container with rounded edges to prevent spillage. It is ideal for women who find it hard to raise their hips because it is not high. A urine collection bag may be attached to the system.

Picture 10. Female urinals

A female *glass-type urinal* (Cygnet) can be used in a standing, sitting or lying position.

A shallow *triangular urinal* can be used in a sitting or lying position. Next to the handle a spout part can be found on the urine container.

There are special clothing outfits that help the application of female urinals. These can be easily opened and closed at the genital area.

A vizelőedények tisztítása

Both the female and male urinals have to be properly cleaned. Different bedpan washers are available to help the staff. When selecting the appropriate bedpan washer, several aspects must be considered:

- Water use efficiency
- Level of noise
- Weight
- Size (needs for space)
- Environmental protection (energy usage)
- Water supply demands (cold, warm, drains)
- Usable programmes (time, mechanical cleaning, disinfection, drying, cost-effectiveness, economical programmes, intensive programmes /for persistent contamination/)
- Compatibility with bedpans already being in use

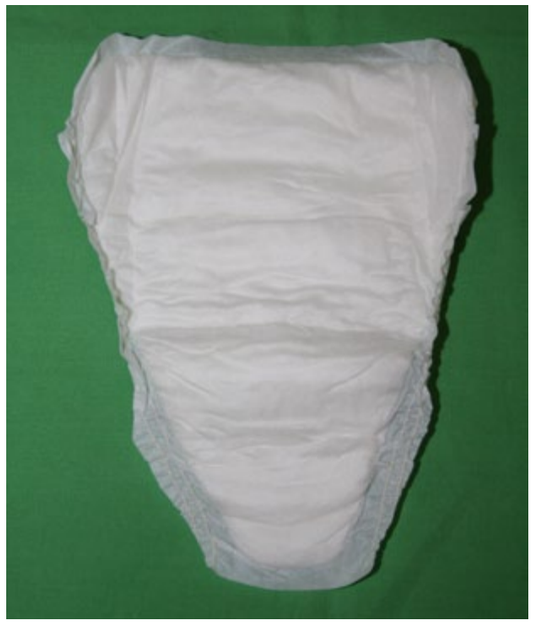
More details can be found in the chapter titled 'Basic hygienic rules in the health care system'.

Incontinence pads and pants *(Pictures 11, 12)*

Fader and his team started from the basic thesis that pressure ulcers and incontinence complaints coincide in almost 100% of the cases. There is a strong relationship between poor mobility and continence problems. In their examination they used a 70-kg phantom body that was laid on a normal foam mattress, a viscoelastic mattress and a surface cut foam mattress. They imitated the naked gluteal region, a urine-filled pad and a dry pad and then measured the pressure difference between the mattresses and the pads. A significant difference was found in the peak pressure between the naked buttocks and the lower body wearing a dry pad. However, there was no significant difference found between the dry and wet pads. In addition, the pressure was significantly lower when the pad under the gluteal region was smoothed out (i.e. a wrinkle-free environment was provided) than when the pad was not smoothed out.

The genital skin condition and the effectiveness of decubitus prevention must be continually checked. If redness of skin or epithelial absence develops, treatment must be started with no delay. The primary function of nursing care is to avoid skin damage and in order to achieve this, continuous monitoring and physical examinations are indispensable.

Picture 11. Pads, Incontinence pants



Picture 12. Incontinence pads

In their study Dunn et al reviewed the application of incontinence products and the efficiency of absorbent products, devices, catheters and accessories based on the publications of specialized literature published from 1982 to 2000. Their work revealed that the products are difficult to associate with the individual demands and patients need the team members' help in choosing the proper products.

In Hungary the application of the INCO-select system is recommended in the selection of appropriate quality products. See a more detailed description of the INCO-select system in the subsection titled 'Special nursing tasks'.

Condom catheter (urinary sheaths) (Picture 57)

It is an external urinary drainage system which has been designed for men. It can be easily fixed to the distal part of the penis with the help of an adhesive strip. It can be well applied in case of urinary incontinence because it is leak-free and reduces the risk of infection. It is made from latex or silicone material, its proximal end is designed to be tube-like, where a urine collection bag can be adjusted, which can be fitted to the patient's leg. According to the size of the penis it is distributed in five sizes, from the small sizes up to extra large sizes (20-25-30-35-40).

There are one-piece urinary sheaths available, in which the inner surface of the condom is provided with adhesive material, it gets immediately fixed when rolled up. Two-piece condoms can be fixed to the penis with the help of an adhesive strip. This is an alternative for long-term urinary catheterization. Errors may arise during its application, which may be due to an inadequate choice in size selection and urine leaks from the condom or it falls off the penis. This type of catheter must remain at the place where it was fitted for 24 hours, up to 48 hours. If latex allergy develops during its application, or the skin of the penis becomes inflamed, using a pad can be an alternative option. (Frank, 2005)

Picture 13. One-piece condom catheter

Penis pouch

If the patient's penis is not long enough to use a condom catheter, a self-adhesive penile pouch can be attached to the penis. The pouch must be emptied as needed and a replacement is required within 24 to 48.

Pubic pressure urinal

This is a urinary device system developed for men, especially for daytime use. It is provided with internal coating, which allows a proper fit for the penis. Its conical version is recommended for patients with reduced mobility and the one with curved ends is for mobile patients. It is suitable for light to medium incontinence.

The proper choice of size is based on the precise determination of the diameter of the penis. It is available in six different flange sizes. This type of device is not aesthetically pleasing, it may violate the feeling of human dignity. After cleaning, it is re-usable.

Special devices for promoting urine drainage: Catheterization

The word "catheter" is of Greek origin. As early as centuries ago people already endeavoured to drain urine and cure painful urinary retention. At that time catheters were made of silver, gold, bronze but also straw and even rolled palm leaves. During catheterization a tube is inserted into the bladder via the urethra, so that urine retention can be relieved, or, as the case may be, just to ease the symptoms of urinary incontinence.

In the 11th century catheters made of silver were bent for easier insertion and attempts were made to implement aseptic techniques. In the 18th century rubber-based catheters were already made, but these were not sufficiently stable. Considering the curvatures of the urethra, catheters were also produced specifically for men in the 19th century. The first generation of catheters were not apt for being held in the bladder so they were fixed to male patients' penis and female patients' thighs. Inflated balloons were started to be applied for fixation in the bladder from the 1930s onwards, which was named after Foley.

The predecessors of today's condom catheters were placed in the market in the 1950-ies.

Guttman's work resulted in intermittent catheterization performed under sterile conditions (in spinal cord injured patients), then the process of sterile intermittent self catheterization was introduced by Lapides. (Mattelaer, 1995; Guttman, 1966; Lapides, 1972)

The application of catheters (Picture 38)

- One-time / Intermittent
- Permanent
  - Short-term: for a few days
  - Long-term: more than 7 days' application

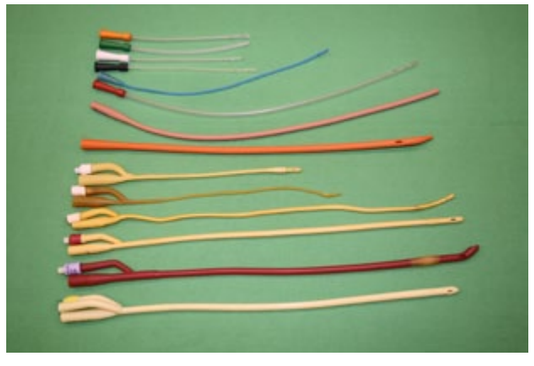
Types of catheterization

One-time / Intermittent catheterization: A one-way catheter not containing a balloon and another fastener (for secure attachment to the bladder) is inserted into the bladder, which is kept in there for about 5 to 10 minutes, then when the bladder has emptied, the catheter is removed. (Picture 39) The bladder may be emptied if necessary, or in pre-planned points of time.

Permanent catheterization

Urethral catheterization:

A balloon or another catheter containing a fastening device is inserted into the bladder so that it can be securely fixed in the long run. The exchange of permanent catheters depends on the material and coating of the catheter, see Chart 6. The types suitable for permanent catheterization are: Foley, De Pezzer and Malecot catheters.



Picture 14. Different types of catheters

Suprapubic catheterization

The contents of the bladder is voided externally through the front part of the abdominal wall, as a catheter containing a balloon or another fixation device is inserted into the bladder through the abdominal wall in the case of urethral catheterization. Compared to urethral catheterization, suprapubic catheterization reduces the incidence of urinary tract infections, however, it increases the risk of bladder and kidney stone development. (Mitsui, 2000; Esclarin, 2000) The system is generally sustainable for 12 weeks but in case of complications or cessation of indication it must be immediately removed.

The incidence of bladder tumours is lower in patients treated with suprapubic catheters than in the case of using permanent catheters. (West, 1999)

Catheter valves (closure valves) *(Picture 49)*

Usually there is no need for urine collection bags constantly when catheter valves are applied. The bladder gets filled, which is emptied by the patient according to his needs.

The valve at the end of the catheter can be easily opened and closed with one hand by the patient so his quality of life may improve. The valve can be adjusted both on Foley and suprapubic catheters. The valve must be opened no later than every 3 to 4 hours, or, when needed. In the night-time hours a urine collection bag can be attached to the end of the catheter, so continuous urinary drainage is ensured at this time of the day as well.

The selected valve should be replaced every 5 to 7 days.

Contraindications (Yates, 2008):

- High-pressure neurogenic bladder
- Autonomic dysreflexia
- Urinary tract infection with fever
- Urethral trauma
- Radical prostatectomy

Relative contraindications:

- A large amount of blood in the urine

Picture 15. Catheter closure valve

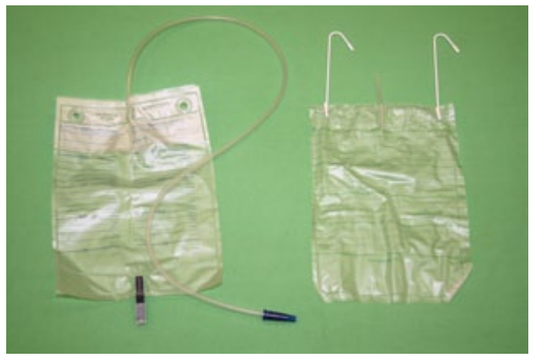
Urine collection bags *(Picture 51):*

A typical modern urine collection bag is equipped with a non-return valve, which prevents the urine from flowing back from the bag towards the urinary tract. The bags are for single use and sterile. They can be adjusted to bladder catheters by conical input ports, the length of the tube can vary from 90 to 100 cm.

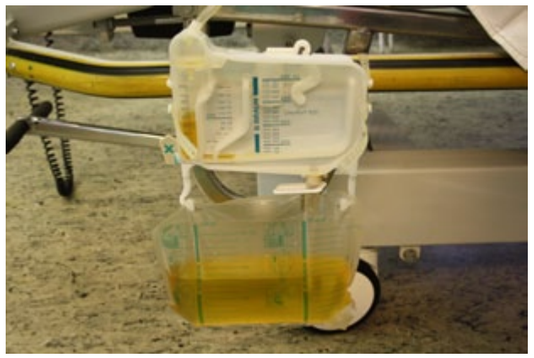
In the course of short-term urine collection one-time catheterization is not applied in infants and small children to prevent nosocomial infections, in their case paediatric urine collection bags must be adhered to the skin surrounding the urethral area. The bag can be adhered regardless of gender. Its capacity is 100 ml that is why it can only be used for short-term urine collection.

For longer-term urine collection, catheterization, the patient's freedom of movement must be ensured, that is why nowadays there are urine collection bags, which can be attached to the patient's leg with leg straps (Picture 54). The bags are designed in a way that patients can easily place them under their clothing, so they can be worn in a discrete manner.

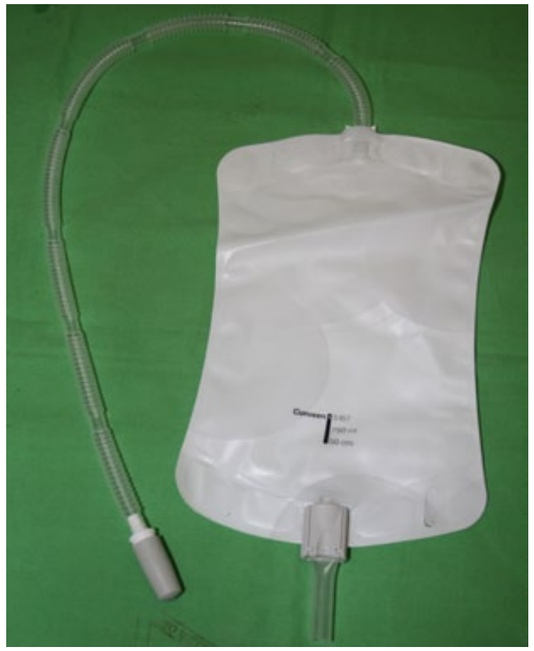
Urine collection bags with urometers make exact, by the hour urine measurements possible (Picture 56). They are used for monitoring hour diuresis. This is a sterile, single-use system with the capacity of 2000 ml. A port can be found on the urine collection bag, which allows taking a urine specimen.



Picture 16. Urine collection bags



Picture18. Óradiuresis



Picture 17. Urine collection bag attachable to the leg

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25. Defaecation

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Anatomical and physiological basics

The digestive system is responsible for the intake of nutrients, grinding them to small pieces, the transfer, digestion and absorption of food and the emptying of indigestible waste products. The digestive system can be divided into an upper, middle and lower section.

The parts of the upper section are: the oral cavity (cavum oris), the pharynx and the oesophagus. The salivary glands (submandibular glandula, glandula sublinguaslis, and parotid gland glandula) discharge their secretion into the oral cavity. The middle section is the stomach (ventricle, gaster) and the small intestine (intestinum tenure), which is divided into the duodenum, jejunum and ileum. The cells that make up the wall of the stomach produce gastric juice. The secretion of the liver and the pancreas are discharged into the duodenum. The liver (hepar) produces bile, the pancreas produces pancreatic juice. Following the section of the duodenum, intestinal juice is produced in the small intestine. The large intestine (colon) belongs to the lower section. The colon begins with the caecum and continues with the ascending colon, followed by the transverse section (transverse colon). The descending colon is followed by the sigmoid colon, which is an S-shaped curved intestinal phase, followed by the straight-running, 15 to 20 cm long rectum.

Defaecation

The *stool (faeces)* develops in the colon as a result of the gradual thickening of the chymus. The characteristic colour of the stool is given by stercobilin (the metabolic breakdown product of bilirubin). Physiologically stool contains water, undigested waste products (e.g. cellulose), digested nutrient residuals, unabsorbed gastric juice, bacteria, endoderm cells, stercobilinogene and fatty acid (10-12%).

Defaecation is a fundamental physiological function of the colon, the result of which is the excretion of waste products from the body. The rectal channel is closed by a double sphincter ring, which are the internal and external anus sphincters. The internal anal sphincter is made up of smooth muscle elements, whereas the external anal sphincter is made up of striated muscle elements. The inner ring has sympathetic innervation, while the external ring has somatomotoric innervation, starting from the neurons located in the sacral section of the spinal cord, by then. pudendus. While being awake the motoneurons that innervate the external sphincter are subjected to continuous stimulation from the upper areas of the central nervous system, so the external sphincter ring tone is in a significant tone, which tone is greatly reduced during sleep. At times like this, the internal sphincter ring plays a significant role in the closure of the rectal channel.

The tightening of the wall of the rectal channel, which is induced by the entering faeces, triggers the defecation process. The defecation process is created by the joint functioning of the enteric and central nervous system, when the abdominal pressure increases, which rises due to the operation of partly the respiratory muscles, partly the abdominal muscles, the muscles of the perineum are also in operation, as well as both anus sphincters are, when they relax. All these together result in emptying the faecal matter from the colon to the external world. Defaecation is a reflex process, and within certain limits it can be controlled voluntarily (the stimulus to have a bowel movement reaches the cerebral cortex and there the stimulation for defaecation becomes aware), which may be suspended. The reflex center can be found in the bottom section of the spinal cord, and the receptors are located in the rectal wall. The voluntary control is not innate; it is developed between the end of year 1 and 2 years of age.

The discharge of intestinal gas (flatus)

Another fundamental physiological function of the colon is the discharge of intestinal gas externally to the body. About 6 to 7 litres of gas pass through the gastrointestinal tract daily, partly in the course of swallowing, or it diffuses to the intestinal cavitis from the blood, and thirdly, the intestinal bacteria produce them (flatulence – stomach and intestinal gas formation). This significant amount of intestinal gas can escape in the following ways: from the stomach through the oesophagus and oral cavity to the outside world, or a part of it diffuses back to the blood, while a smaller portion of it is excreted through the rectal channel in the same manner as the mechanism of defaecation.

The observation of faeces

The assessment of defaecation consists of the ***observation*** of the stool, as a form of discharge, and in case of a patient who is capable of being contacted, of ***questioning*** the patient, during which there is data collection going on about the *daily number of bowel movements, the quantity of the stool, its colour, smell, consis-*

tency, bacterial content and abnormal components. If taking a history is not possible, it is the nurse's task to observe any potential problems regarding defaecation. In the course of nursing the characteristics of stool, as a form of discharge, are to be observed, documented and potential changes must be referred to the physician within a short period of time. The quantitative and qualitative changes in the stool may be of diagnostic significance.

The number and amount of defaecation

Normal defaecation habits may vary for different individuals. Normally, faeces are excreted *once or twice a day,* or a patient defaecates *3 to 4 times a week.* Its normality is determined by the emptying frequency and not by the daily volume. The amount of soft stool, formed approximately at identical time, is *about 150-200g,* the mass of which is influenced by the quantity of food consumed, its waste material content and the speed of the metabolic process.

The colour of faeces

- Physiologically the colour of an adult's stool is *brownish,* which colour is given by stercobilin, that is produced during bilirubin metabolism. Babies' stool is yellowish due to breastfeeding.
- In case of *light-coloured, oily* faeces, there are fat digestion problems in the background.
- *Dark green and/or yellow* stool can be caused by e.g. an excessive amount of bile excretion, diarrhoea, the consumption of vegetables rich in chlorophyll (e.g. cabbage, spinach).
- *Light-coloured, white, clay-coloured, acholic* faeces is caused by the obstruction of the ductus coledochus, the development of obstructional ileum, gallbladder mobility disorders or cholecystitis.
- *Slimy, transparent* faeces is characteristic of the stool of a patient who suffers from spastic diarrhoea or ulcerative colitis.
- Several types and causes may be distinguished for a *bloody* stool. They are as follows:
  - Emptying *black, tar-like stool* is caused by bleeding originating from the upper and/or middle section of the gastrointestinal tract, by the consumption of black pudding, animal harslet, red wine, blackberry, medication containing iron, carbon tablets.
  - *Melaena* is pitch-black, loose, gelatinous stool with colloidal nature. It may be caused by e.g. gastrointestinal bleeding originating from the stomach or from higher anatomical regions, or general gastrointestinal bleeding that has developed as a complication of kidney deficiency (uraemia). On the patient's hospital chart it should be indicated with the letter "M" written in red.
  - The reason for emptying *reddish* colour stool is gastrointestinal bleeding or the consumption of beetroot.
  - Stool with *blood stripes* appears due to forced defaecation or the rupture of haemorrhoids.
  - *Bloody, mucous* stool is the result of inflammatory intestinal diseases or neoplasm.
  - Emptying stool coated with *fresh, red* blood may be caused by the presence of a malignant tumour or more intensive haemorrhoidal bleeding. In this case blood has not been digested.

In addition to the symptom of high fever, shigelliosis is accompanied by emptying massive bloody stool.

Stool odour

- Physiologically it is also of *characteristically unpleasant* odour.
- It has a *rotten-like,* very foul smell in case of protein digestive dysfunction.
- It has the *sour smell of fermentation* in case of carbohydrate indigestion.
- It has a *stronger fermented* smell (mashed fermenting fruit smell) after the consumption of a large amount of hard liquour, e.g. brandy.
- It has a *sweetish, extremely foul smell* after emptying melaena.

The odour of faeces can be of diagnostic significance, especially in case of infants, e.g. congenital and acquired oligo and disaccharide malabsorption in infancy is characterized by a sour-smelling diarrheal stool.

The consistency of faeces

- *Formed* stool is normal stool.
- *Hard, berry-like* stool occurs in case of little fluid consumption and constipation.
- *Regular, pasty* stool is caused by malabsorption, excessive food intake, certain food products, fruit with a mild laxative effect (apricot, plum), mild laxative medicaments.
- If *loose* stool is emptied either once or several times, it is to be considered diarrhoea. Liquid stool can also be caused by decreased absorption.
- *Bloody, mucoid* stool occurs in case of intestinal inflammations of non-infectious origin (e.g. ulcerative colitis, Crohn's disease).
- *Bloody-watery* diarrhoea is emptied e.g. in case of dysentery.

The pathological components of faeces

- *Too much water,* in case of diarrhoea.
- *A large amount of fat:* the faecal excretion looks shiny and bright, it is of large quantity and on top of the fluid around it spots of fat may appear; this is fatty stool. It is primarily caused by pancreatitis and malabsorption syndrome, or other malabsorption, enteritis, or a condition after an enterocolectomy surgery.
- *Digested or fresh blood* means fresh blood in the stool, blood-streaked stool, melaena.
- A *foreign body,* which can cause a suppurative and/or bloody pathological change, depending on how long it has been in the digestive tract and what type of alteration it induced by its size and shape.
- *Pus,* in case of enteritis.
- *Mucin (Mucus),* e.g. in case of intestinal inflammation not caused by infection (colitis), irritation (e.g. swallowed objects), stress.
- *Certain types of bacteria,* pathogens.
- *Undigested food.* Depending on the type of food, however, it may normally be present as well, e.g. the shell of legumes, corn.
- *Intestinal worms* can cause problems mainly in children. Infection caused by pin-worms (Oxyuris vermicularis) is common, the symptoms of which may include excessive appetite, weight loss, itching around the anus and insomnia. Other commonly occurring worms are the stomach-worm (Ascaris lumbroides) and tapeworms (taenia).

Tests in case of intestinal dysfunctions

Prior to diagnostic tests it is important to take a case history. For example, in case of chronic constipation the following issues should be discussed: symptoms, associated diseases, medications, lifestyle and diet; in case of women, true pelvic surgeries, true pelvic inflammatory diseases, the number and manner of previous childbirths, the birth weight and position of the newborn baby and if there was a prolonged expulsion phase.

In case of intestinal dysfunction, the following diagnostic tests may take place (Royal College of Nursing, 2008, Illés-Király, 2007):

- *rectal digital examination* (RDE)
- *gastrointestinal and nutritional log* application
- *endoscopic examinations:* rectoscope, sigmoideoscope, colonoscope
- *ultrasound test*
- *X-ray examination:* proctogram, irrigoscopia, native abdominal X-ray
- *colontransit test:* a native abdominal X-ray examination is carried out on the third day after having swallowed some radiopaque marker
- *evacuational proctography* (defaecography): it examines the muscle function of the pelvic floor during a bowel movement, the dynamics of evacuation is shown with the help of 99-meta-technetium isotope or barium by a videofluoroscopic examination.
- *CT, MRI*
- *anorectal manometry:* an examination of the perception threshold of the rectum and the rectal closing muscle function performed with a fluid perfusional system, which is based on pressure measurement.
- *ballonexpulsion test:* it serves the screening of evacuational problems by using a balloon filled with 50 ml of fluid while applying a manometric catheter.
- the *observation of faeces* (consistency, frequency, quantity, form), the application of the Bristol Stool Form Scale
- taking a stool specimen.

Stool examination, stool sampling purposes and methods

A stool examination is a *laboratory series of tests* during which stool samples are tested in order to filter out certain liver, pancreas and intestinal diseases. Infections caused by parasites, bacteria or viruses and nutrient absorption disorders are detectable this way.

During the examination chemical, microbiological tests and microscopic examination are carried out. The following characteristics of stool are examined: its colour, smell, form, density, composition, pH, and also its phlegm, mucus, blood, fat, meat fibre, white blood cells, bile and sugar content.

Bleeding may be caused by a malignant disease of the colon. As part of a routine examination, and/or if necessary, a yearly examination can be done over 50 years of age (according to the recommendation of the American Cancer Society and other organizations). A positive faecal blood test result means that somewhere in the intestinal tract bleeding occurs. This can be caused by ulcers, bleeding polyp, nose bleeds, haemorrhoids, bleeding gums, inflammatory bowel diseases, mucosal injury, benign or malignant tumors.

Several types of test can be applied in order *to detect human blood* in the stool. These include the mailable version of the *guaiac test* applied on filter paper (e.g. Haemocult), the usage of which is common. The stool sample has to be placed on the test paper impregnated with a reagent, then hydrogen peroxide drops need to be applied on it and 1or 2 seconds later the result can be read (in case of blue discolouration it is positive). Prior to sampling a special diet must be observed in order to avoid false-positive results.

Taking a stool specimen

Bacteria, viruses and parasites are searched for in the stool during microbiological tests, when the goal is to exclude gastrointestinal infections. If a patient has diarrhoea, he is potentially considered infected and a stool specimen should be sent for microbiological examination. The test is necessary, because diarrhoea may be caused by a Clostridium difficele infection and in in-patient facilities cross-infections can also occur in patients. Self-sufficient patients, who are capable of taking specimen of their own stool, decrease the risk of developing cross-infections. In this case, the patients must be

Table 1. Taking a stool specimen

	Steps	Explanation
1.	Perform hygienic disinfection of the hands.	Due to keeping the rules of sepsis-antisepsis.
2.	Identify the patient and inform him about the necessity and process of the intervention.	This way the patient's fear can be decreased and his willingness to cooperate can be promoted.
3.	Prepare the devices necessary for taking a stool specimen.	
4.	Perform hygienic disinfection of the hands, put rubber gloves and a plastic or rubber apron on.	In order to decrease the number of microorganisms.
5.	Request the patient to empty his bladder, in case he cannot separate this from defaecation.	The pathogens present in urine may influence the result.
6.	Undresss the patient's lower body if he is unable to do it independently.	
7.	Place the bed-pan under the patient according to the protocol.	
8.	The patient evacuates his stool.	
9.	Carry out the sampling. In case lesions are macroscopically visible in the stool, e.g. blood, pus, parasytes, take a sample from that part of the stool where they can be seen, otherwise from the the central part of the stool. The specimen is to be placed into the crucible or the testing card.	
10.	Tidy up the patient's environment.	
11.	Arrange the produced waste materials selectively.	
12.	Wash your hands hygienically.	
13.	The patient's name and date of sampling must be recorded on the crucible/s and the accompanying forms must be filled in and along with the specimen they must be submitted to the laboratory. In case of a stool blood test, the test should be carried out according to the instructions of the manufacturer. Guaiacos test (e.g. in case of Haemoccult): the stool sample impregnated with the reagent must be placed on the test paper, then hydrogen peroxide drop/s must be applied on it and 1-2 seconds later the test result can be read (in case of blue discolouration it is positive).	
14.	Document the procedure: the time of the intervention (day, hour), the colour, smell and consistency of the stool.	

taught to perform hygienic washing of the hands before and after sampling. A further rule is that the stool must be emptied into a bed-pan because the toilet bowl is very likely to be saturated by pathogens. Specimen need to be collected from three different stools, usually on three consecutive days.

One of the means for sampling is the *stool container* (the so-called *"F" container*) of 20 cm^3 in two boxes, provided by the National Public Health and Medical Officer Service, which is suitable for the detection of a culture of bacteria, toxins, parasites and virus antigens. For parasitological examinations stool specimen taken from stool evacuated on three consecutive days are needed. The specimen must be taken with the provided spoon from the suppurative, mucinous, bloody part of the stool which has not been in contact with its environment and about two-thirds of the container must be filled with it. In case of infants, the faeces emptied to a nappy and then spread on a cotton swab is apt for a test. The stool samples should preferably be submitted to a laboratory immediately (within 4 hours). Until transport the specimen is to be kept in a cool place, in case of a longer storage (24 hours), it must be kept in a refrigerator (at 2 to 8°C). For submitting a stool sample in case a typhoid disease is suspected, the "Ty-container" is used.

Taking samples from the perianal area (anorectal scrapings sample) is done with a *Scotch tape stripe or a cellophane capped cotton swab,* its goal is to detect Enterobius vermicularis oocytes. The specimen must be taken after getting up, before defaecation and washing from the folds of the buttocks pulled apart. The sample can be stored at room temperature up to a couple of days.

For the examination of stool blood specimen has to be taken into a *stool blood container* (maybe directly onto the test card). Sampling should be done at random: the lubricating wand, which belongs to the container, has to be inserted in three different parts of the stool and the amount of faeces remaining on the wand should be enough for testing.

For sampling, the patient defaecates into a bed-pan, from where the stool specimen is taken to a 10-ml collection container with a sampling spoon with a reception (in case of incontinence samples can be obtained from the bed-linen or the nappy as well, however, the latter is not recommended, because stool and urine usually get mixed in it). Each stool sample must be collected in a clean crucible and it must not be contaminated by urine or water. If the patient is unable to evacuate stool, but its examination is needed, an enema is given. In this case the liquid to be infused may be a small amount of tap water or normal salt solution. Other additive substance may cause false-positive results.

The protocol for taking stool specimen

The devices to be prepared are as follows:

- stool container (F / Ty), Scotch tape stripe, cellophane capped cotton swab, stool blood container
- rubber gloves, rubber apron
- sampling device, e.g. a spatula
- paper towel
- bed-pan
- bed protection, in case specimen has to be taken from a patient confined to bed
- a memo card

The indication of stool on the patient's hospital chart

- Formed stools are marked with a vertical line in the appropriate column.
- The mark for a diarrheal stoolis is a slash.
- Pitch-black and bloody stool are marked either with a red line or with the letter "M" written next to the mark.
- If there is no stool, it is marked with a zero or a crossed zero; the administration of an enema is marked with the letter "B".

Any additional assessments must be indicated on the nursing care form, e.g. foul-smelling or a large amount of stool; the findings received during the assessment of needs, the precise plan regarding the assistance in the evacuation and the course of the results.

Diarrhoea

During diarrhoea fluid, loose or thin stool is excreted more than three times, and/or the amount of faecal excretion is larger than 200 g, within 24 hours. It can be of acute or chronic nature. Liquid, loose stool is excreted, mostly accompanied by excruciating cramps.

In case of tenesmus there is a very frequent or constant stimulus to defaecate resulting in little stool (little mucin) or no evacuation.

Diarrhoea is caused by:

Gastrointestinal diseases, lesions (e.g. mutilation of the stomach, irritable bowel syndrome, tumour, short bowel syndrome, condition after cholecystectomy due to the malabsorption of bile acid, pancreatic diseases, in case of parathyroid and adrenal diseases, laxative abuse, food allergies, intolerances, infections, parasites, psychological disorders (e.g. stress, anxiety), medications, radiation therapy, metabolic diseases, malabsorption.

Due to emptying diarrheal stool, the skin care of the perianal area isimportant, especially when this status is coupled with incontinence. The soiled skin has to be cleaned, but friction or pulling of the skin must be avoided because microtraumas are formed on the skin and secondary infections may develop. There is a wide range of cleaning agents, with liquid, emulsion, foam or impregnated texture that can be applied such as protective creams, ointments, lanolin and water-based types of cream, polymer-based non-alcoholic water sealing foils or cleaning foams which do not require rinsing. There are products which must be avoided in skin care and skin cleaning, such as dry toilet paper, soap, skin disinfectants containing alcohol and talcum powder (Wilson 2008).

Devices suitable for capturing diarrheal stool are:

- *Pads:* they absorb the liquid components of faeces but the solid components remain on the skin and irritate it.
- *Faecal collectors:* they are adhesive bags, which can be administered to the cleaned and wiped dry area of the perineum and rectum.
- *Anal plugs:* they are similar to suppositories, made from some foam-like material, they can be placed to the rectum and removed from there with a pulling thread.
- *Faecal systems:* a low pressure rectal balloon is placed in the rectum. The continuation of the balloon is a silicone catheter, which ends in a collecting bag.

Constipation (obstipatio)

During defaecation dry, berry-like, lumpy stool of solid consistency is emptied. The evacuation process is difficult. The symptoms are excessive straining, hard stool, pain, a feeling of discomfort, the individual does not feel that his intestinal system has completely been emptied, defaecation occurs less frequently than within three days, the evacuation time exceeds 10 minutes. Stomach pain, cramps, loss of appetite, decreased bowel sounds may accompany the process (Gliav et al 1997).

Constipation is not a separate disease, it is a symptom of some sort of medical condition or a lifestyle deficiency. Based on a survey by the American Society of Colon & Rectal Surgeons 80% of people suffer from constipation during their lives. According to Satish SC Rao, if there are constipation symptoms for three to six months, we speak about chronic constipation (Rao et al 2010, Ramkuman et al 2005).

Statuses that provoke the development of constipation are:

- Lifestyle factors: e.g. inappropriate nutrition, inadequate fluid intake
- Psychological factors: e.g. anxiety
- Side effects of medication: e.g. antidepressants
- Physiological changes: e.g. aging
- Pathological statuses: e.g. neurological diseases (e.g. Parkinson's disease)
- Environmental effects: e.g. travelling

Complications of chronic constipation

Faeces insertion (impactatio faecalis)

The hardened, gathered up faecal matter (skybalum) is wedged in the rectum. Debilitated, confused and unconscious patients are at increased risk of this status.

Haemorrhoidosis (haemorrhoids)

The lower section of the colon, the anus and the rectum may be damaged by stagnating stool clots. The blood vessels of this area may become inflamed. A swelling around the anus may develop, as well as bleeding and pain, which become increased during defaecation.

Lifestyle advice to individuals suffering from constipation

- *The consumption of high-fibre food.* 20 to 30 g of fibre is recommended for adults. The consumption of whole wheat products, high-fibre cornflakes.
- The consumption of vegetables, fruit, regarding the latter, it serves the purpose to leave the peel on.
- There is no fluid limitation but the most practical is to drink water. Alcohol and coffee may cause constipation.
- *Physical activity* also plays a significant role in this respect.
- In case of chronic complaints it is recommended to the patient to keep a *defaecation log.* It is advisable to set a point of time for every day when the patient is escorted to the toilet in order to have a bowel movement. Before the appointed time the patient should be given liquid, which enhances peristalsis (hot drinks, fruit juice), and provided 15-20 minutes of peaceful time.

Therapies for constipation

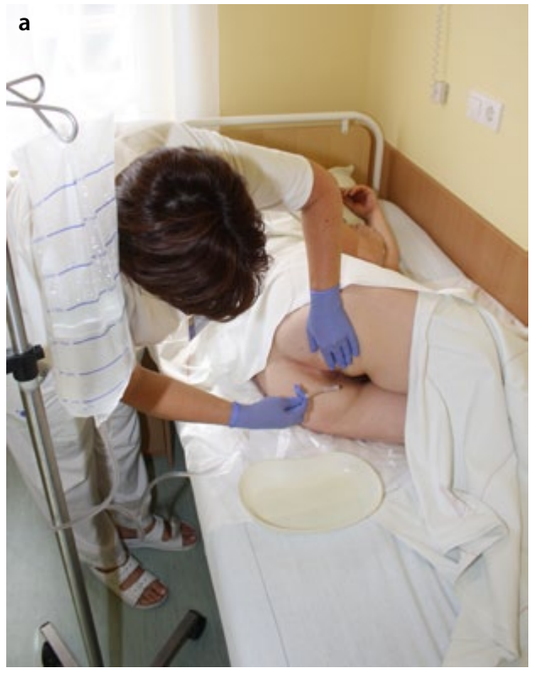
Other than the above-mentioned methods *(diet, physical activity, exercise, biofeedback,* etc.), *medicational purge* and *surgery* may be necessary. In addition to these, an *enema* and *faecal clot removal* may also be performed for the treatment of constipation. Depending on the constipation, surgical procedures may involve doing subtotal colectomy and anastomosis ileorectalis, maybe the application of stoma formation and anterograde enemas.

Enema

During an enema, *liquid is administered into the rectum* and the lower section of the colon through the rectal sphincter. A flexible plastic tube with several large holes can be used for an enema. The enema tube can be connected to the bag or container containing the enema liquid by a rubber tube. The goal of an enema is most commonly to enhance the peristalsis and also the evacuation of stool or flatus from the rectum e.g. before surgery and giving birth. Besides this, an enema may also be applied to administering medication into the body and for feeding.

An enema may also be performed with a pre-packaged device, when the enema liquid can be found in a plastic bottle, which is attached to a pre-lubricated enema tube.

To administer an enema the patient has to be positioned in *Sims position* (lying on the left side, legs held up), or in a *knee-elbow position.* During implementation place the lubricated tip of the enema catheter at the anal opening, and gently advance the catheter through the anal sphincter into the rectum toward the umbilicus (navel), 7.5–10 cm for an adult. Insert the tubing 5 cm for a child older than six years and 2.5 cm for an infant. The height of raising the enema liquid container depends on the type of enema (low or high enema) and on the patient's age. The container is held approximately 45 cm (max. 46 cm) in case of high enema, with low enema it is held about 30 cm, whereas in case of infants about 8 cm (up to 15 cm) above the patient's hips, to induce the flow of the fluid. In order to get the solution into the body, pressing the container might be needed; however, the fluid must not be administered too fast. Generally speaking, 1 litre of enema fluid should be administered in 10 minutes; this is the appropriate speed for getting the enema fluid into the patient's body. In case of abdominal cramps, the liquid administration speed must be reduced or even the temporary cessation of administration may be needed. In this case relaxation can be encouraged by having the patient breathe slowly through the mouth (Pictures 5 and 6). If the liquid does not flow properly, gently rotate the tube in the rectum so that you remove the holes of the tube from the intestinal wall, or the impactational stool is prevented from blocking the holes and thus the route of the flow. After administering the enema, close the tube, remove the enema catheter and release the patient's buttocks. Patients who are incapable of holding the enema fluid for the appropri-



Pictures 1. a, b. Enema

Table 2. Process of enema

	Steps	Explanation
1.	Perform hygienic disinfection of the hands.	Due to keeping the rules of sepsis-antisepsis.
2.	Prepare the necessary items for an enema (including also the enema fluid) and the environment. In case you are about to give a medicated enema, check the name, dose and expiration date of the medicine to be used. Make sure that the right medicine is given in the right dose and form, by the right person to the right patient with the right reaction at the right time. For bed-linen protection put a water-proof sheet on the bed. Place the bed-pan and toilet paper within quick access. Send the visitors out, close the hospital room door, use a folding screen.	It is important to ensure the right to human dignity, since this intervention is unpleasant for the patient due to his uncovered lower body.
3.	Prepare the patient: identify, inform and reassure him, observe his vital parameters. Besides the assessment of the general status and the physical examination, interviewing the patient is an important part of preparation, during which the patient must be asked about his basic conditions (any disease associated with haemophilia), his medication habits, whether he takes any anticoagulants (e.g. aspirin, clopidogrel, dalteparin, coumarin, etc.). The patient's state of mind, level of alertness, ability and willingness to cooperate in implementing the procedure, his level of knowledge has to be assessed to know the level of education he must be provided for. To determine the patient's level of anxiety, his verbal and non-verbal signals need to be assessed as well. It is indispensable for the intervention that the patient exactly follows all the instructions and takes the appropriate body position. The patient must be informed of the purpose and the process of the planned intervention, the potential complications, the things to be done after the procedure, taking his age, status and intellectual level into account. Explain that after the enema the instilled fluid must generally be retained for 5 to 10 minutes (30 to 60 minutes for retention enemas and even longer for certain medicated enemas) so that the enema is effective. Let the patient know about the necessary body positions during and after the interventions and check if he is able to carry those out independently. !!!!!!!!!! Különösen figyeljen a pulzusra, ugyanis a beavatkozás következtében, a nervus vagus izgalma miatt bradycardia alakulhat ki !!!!!!!!!!!!!!!!!!!!!!!!	Pay extra attention to the pulse, since bradycardia may develop as a result of the intervention, due to the excitement of the vagus nerve.
4.	Ask the patient to empty both bladder and bowel, if possible, then have the patient undress completely from the waist down.	
5.	Position the patient in the proper position: Sims-position or knee-elbow position.	
6.	Emphasize the importance of breathing through the mouth.	In order to relax the rectal sphincter.

7.	Put rubber gloves and a rubber apron on.	In order to ensure the staff's own safety.
8.	Eliminate air from the enema mounts, then close the tubing with a clamp and place the container / bag on the stand.	Do not instil air to the rectum.
9.	Put lubricant on the tip of the enema tube.	
10.	Lift the upper buttocks to see the anus and to touch it with your finger. Examine if there is an injury, bleeding or any other abnormality. If you notice any abnormalities, notify the attending physician.	The examination of the rectum is an important diagnostic method. In certain cases, the enema is contraindicated (e.g. bleeding, prolapse, carcinoma).
11.	Place the tip of the enema tube to the anus, then with a gentle movement press the tube further in, through the anal sphincter toward the navel by 7.5–10 cm for an adult, by 5 cm for a child older than six years and 2.5 cm for an infant.	
12.	Warn the patient, then open the enema tube and slowly raise the enema fluid container, with a high enema to about 45 cm (max. 46 cm), with a low enema by approximately 30 cm, while in case of infants by about 8 cm (max. 15 cm) above the patient's hip, in order to aid the flow of the fluid. Squeeze the container until all the solution is instilled into the colon (1 litre in 10 minutes).	The patient must know when the flow of the fluid begins, this way he can pay attention to breathing as well (so that it is steady breathing through the mouth). This helps in relaxation.
13.	If the patient complains of cramping, slow the speed of instilling the fluid or stop the enema flow and ask the patient repeatedly to breathe slowly through the mouth to encourage relaxation.	
14.	Hold the rectal tube in place throughout the whole procedure. If the fluid does not flow properly, gently rotate the tube within the rectum to clear the holes of the tubing from the wall of the bowel, or to prevent the impacted stool to block the holes and therefore the path of the flow.	
15.	After having administered the enema, clamp the tubing, remove the enema catheter, and release the patient's buttock.	
16.	Cover the client and tell him that the tightening, unpleasant feeling is normal. Ask him to try to retain the fluid for 5 to 10 minutes (in case of an infant, squeeze the the buttocks together for a few minutes, keeping the fluid inside). You can assist with retaining the fluid by pressing a gauze pad to the anus.	This can help the patient to feel more secure.
17.	Assist the patient with the bed-pan or the bedside toilet (commode) or escort him to the toilet.	Make sure that the bedside toilet, the bed-pan and toilet paper are within quick access. In case of an independent patient arrange for the toilet to be nearby and easily accessible.
18.	Observe the evacuated stool, assist the patient with carrying out his hygienic needs, check his vital parameters.	Observe whether the faeces has some pathological characteristics (its colour, smell, consistency, composition), in case of a cleansing enema observe how clean the liquid is.

19.	Wash items that might be reused (e.g. non-disposable enema container and tubes) with warm, soapy water. Rinse the items and allow them to air dry. Place disposable items (gauze pads, gloves) in a trash bag for dangerous litter. Send the items to be sterilized to the sterilizer (e.g. enema tube and container, clamp).	
20.	Perform hygienic hand disinfection.	
21.	Document the proceeding: the time and result of the enema and the person who administered it.	

ate duration of time may require having their buttocks pressed together. Cooperating, disciplined patients with the appropriate skills should be allowed to self-administer non-medicated enema under the direction of a nurse, while it may be necessary in some cases that the patient or his family members are taught to administer an enema in the home setting.

Cleansing enema / evacuant enema

A cleansing enema may be applied to treat *constipation* and for *cleansing* the rectum and the lower section of the sigmoid intestine *before examinations and surgeries*. The in-going fluid widens the intestines, enhancing peristalsis by this and it softens the stool. After having administered the enema, the fluid should be kept inside the body for 5 to 10 minutes. Since the purpose is to clean the intestines, it often occurs that the intervention has to be repeated, but an enema should never be delivered more than three consecutive times.

Based on the amount, cleansing enemas may be of two types: *large-volume enemas* in which case 500-1000 ml of fluid is administered, and *small-volume enemas,* when the amount of liquid to be administered is between 50 to 200 ml. In the course of cleansing enemas *tap water (hypotonic solution), salina (isotonic solution)* and hypertonic solution may be given.

In case of hypotonic enemas tap water is used, a significant proportion of which may be absorbed from the lumen of the intestine in the course of osmosis, burdening with this the patient's circulation. Consequently it is an incorrect nursing practice that in certain institutions cleansing enemas are given unlimited number of times until the result is reached ("until clean water enema").

In case of an isotonic application the instilled fluid is neither absorbed nor draws water from the intestinal wall, it achieves its effect by the instilled water dilating the bowels, stimulating peristalsis and lubricating the stool.

A cleansing enema can be classified also *based on the intestine involved:* in case of *high enema,* the purpose is the cleansing of the entire colon, while a *low enema* is targeted to empty the rectum and sigmoid colon.

Given the above, some of the types of enema outlined below can also be classified as cleansing enemas, depending on how the types of enema are categorized (e.g. soapsuds enema, laxative enema).

Soapsuds enema / SSP

In the course of a *soapsuds enema / SSP,* a cleansing enema, water with soapsuds (foam) may also be given in order to promote defaecation. However, due to its intestinal irritant effect this procedure is rarely applied. In case of administering this procedure, only a special type of soap (Castile Soap) is allowed to be used.

Medicated enema

Enemas can also be applied to administer medicated solutions, so the medication gets directly into the bloodstream, while being absorbed through the mucous membrane of the rectum. This way the medicine does not have to pass through the entire intestinal tract. The product must be held in the rectum for an appropriate duration of time specified in the instructions. The most commonly used medicated enemas are: *enemas with steroid solution* (for reducing bowel inflammation, in case of ulcerative colitis), *antibiotic solution enemas* (in case of local bacterial infections), *hypertonic solution enemas* (in case of high potassium or ammonia level in the blood) because the potassium and ammonia from the blood get to the hypertonic solution through the intestinal wall and are evacuated together with the faeces (e.g. steroid solution, antibiotic solution).

Although most of the medical literature discusses them separately, we note that in a certain sense, medicated enemas include sedative, analgesic, anthelmintic, astringent, carminative, starch, stimulating, and even soapsuds and oil enemas as well.

Constrictive / astringent enema

As a result of this type of enema the blood vessels are constricted in the intestinal wall, thereby giving temporary relief to the inflamed area. The rule is that the enema tube should be instilled slowly and pullled out quickly to avoid tympanities and the irritation and pain of the inflamed area.

Barium enema

To perform a contrast material X-ray examination of the colon, it is necessary to instil the contrast material containing barium into the patient's body in the form of an enema. *Barium sulphate* is the only barium compound which is not toxic.

Oil enema / oil retention enema

A smaller amount of solution is administered, which must be retained in the bowel for an *extended period of time (30 to 60 minutes)*. In case of constipation the purpose of delivering this type of enema is to soften the stool and thereby allow a normal bowel movement. For an oil enema *olive oil* (180 ml), *castor oil* (60-120 ml), *gingelly oil* (150-180 ml), the *1:2 rate mixture of castor oil and olive oil* can be used. The solution temperature should be 37.7°C. It is often followed by a large-volume cleansing enema.

Carminative enema

It is a small volume enema administered with hypertonic solution (e.g. MGV solution: 30 ml of *magnesium,* 60 ml of *glycerol* and 90 ml of water).

Return-flow enema (in other words Harris flush)

A return-flow enema can be used to expel flatus (intestinal gas) and also to increase peristalsis. It is primarily applicable after abdominal surgeries to decrease intestinal distention and to promote re-launching the bowel functions. It is a small-volume enema, during the administration of which 200 ml of solution is instilled into the rectum. In order to prevent cramps and a feeling of discomfort the temperature of the liquid is 40.5-43°C for adults, 38°C for children. The procedure differs from those described regarding enema that the fluid should be instilled into the rectum from a container raised 35-40 cm above the level of the rectum (7.5 cm in children), then the tube must be closed. Subsequent to this the container has to be lowered to 30.5 to 45.5 cm below the height of the patient's rectum and the tube must be opened. After the emptying of the liquid has ceased, the tube must be closed again and the container has to be lifted up again to 30.5 to 45.5 cm above the level of the rectum, then the tube must be opened and 200 ml of liquid has to be made to flow to the rectum again. Subsequently, the procedure must be repeated until flatus is expelled with the proviso that institutional protocols generally allow the process to be repeated up to three times.

*

Instead of an enema fluid container or an enema bag, an enema ball or a pear syringe can be used (their application is especially practical in home applications). With these devices a low enema can be administered, 250-800 ml of liquid can be instilled to the sigmoid colon. Nowadays a device integrated to the toilet bowl can also be applied, with the help of which the anus can be continually massaged. In addition to these, there is also the irrigation bed, which is a device ensuring both the implementation of enema and also the subsequent bowel movement to be done in an identical, supine position. With the different versions of the latter device, the temperature of the fluid, the speed of instillation, the fluid pressure and also the evacuation can be electronically controlled according to the desired purpose.

Contraindications of enemas

Today, more and more people perform enemas at home, which, other than its beneficial effect, can be dangerous if applied too often, or if it lasts too long, or if the risks are not taken into consideration, or if this intervention is not preceeded by a thorough examination. It is important to know the cases when enemas require greater precaution, and when they are contraindicated.

- Enemas must not be used as a first-line treatment for constipation.
- A patient with *diarrhoea* is unable to retain the instilled enema fluid.
- Ordering an enema for *patients with a heart disease* (arrhythmia or recent myocardial infarction) must be reconsidered and in case it is necessary, increased precaution is required upon its administration.
- An enema is not allowed to be given in case of *abdominal pain of an undiagnosed origin* because the increased peristalsis due to an enema can cause perforation in case of appendicitis.
- Enemas may only be given after careful consideration and with enhanced precaution in case of a recent rectal, bowel or prostate surgery.
- An enema is risky in case of *rectal bleeding or prolapse* (However, an astringent enema may be justified.).
- Enemas also carry a risk in the following cases: *abdominal hernia,* within 12 weeks following *abdominal surgery, severe tympanites, severe anaemia, acute liver deficiency, aneurism* and *colon carcinoma*. In addition to these, if there is *Crohn's syndrome* (exception: e.g. steroid or astringent enemas), *colitis ulcerosa* (exception: e.g. steroid or astringent enemas), *uncontrolled hypertension or severe congestive heart failure*. It is important to consider the constraints on fluid intake in case of *dialysis patients.*

Enema protocol

The items to be prepared are as follows:

- protective clothing: rubber gloves, rubber apron
- bed-linen protection: rubber sheet, textiles
- enema tube:
  – For adults: 22–30 French (7.4–10 mm outer diametre)
  – For children: 12–18 French (4–6 mm outer diametre)
- Solution used for enema, the amount and temperature of which depends on the type of enema and the patient's age.
- enema fluid container or enema fluid bag
- clamp
- lubricant gel or vaseline
- toilet paper
- bed-pan or bedside toilet
- washing glove, towel, wash-basin

Different defaecational environments and methods

It is important to ensure proper circumstances, no matter whether bowel movements are regular or irregular. Naturally, in a hospital setting, it is more difficult than at home, but the optimal situation, point of time and manner must be strived for. In case of temporary, long-lasting or permanent disability *rolling bedside toilets (Picture 2)*, *bed-pans* and *nappy pants* may be needed. The latter is also used in case of faecal or urine incontinence and upon their application there is a high risk for developing decubitus. In certain cases (e.g. after the fracture of the femoral neck) a toilet seat heightener may be required.

Evacuation through stoma, enema and *faecal clot removal* are non-physiological ways of defaecation.

The application of bed-pans

Bed-pans should only be used when indicated and not used for the convenience of the nurse caring for the patient. Upon the application of bed-pans, it has to be considered that certain patients are unable to empty faeces in a lying position. During the procedure, the headboard of the bed should be raised in 30 degrees if it is not contraindicated. In case of immobilized patients, the headboard of the bed has to be set in a horizontal position and the patient must be turned to one side, then after having powdered the patient's lower back and buttocks, the bed-pan can be placed to his buttocks and the nurse must fix the bed-pan with one hand and hold the patient's hip with the other hand in this position *(Picture 3*).

Picture 2. Rolling bedside toilet

Picture 3. ábra. Applying a bed-pan

Bed-pan application protocol

The items to be prepared are as follows:

- bed-pan (preferably use a disposable paper bed-pan, but if a metal bed-pan is used, run warm water on it)
- toilet paper
- rubber gloves
- washing glove, towel and wash-basin
- liquid soap, talcum powder.

Stoma care

The most common diseases (tumour, inflammation, diverticulitis, perforation, trauma, congenital disorders) of the lower tract of the gastrointestinal system may necessitate a temporary or permanent change in the physiological route of the stool, or the formation of an enterostoma.

"Stoma" is a Greek word, meaning orifice, opening (Burch, 2008). The basic purpose of enterostomas is to ensure bowel emptying (Gaál, 2010).

Table 3. The application of bed-pans

	Steps	Explanation
1.	Perform hygienic disinfection of the hands.	Due to keeping the rules of sepsis-antisepsis.
2.	Prepare the environment. Send the visitors out, close the hospital room door, use a folding screen. Prepare the necessary items.	It is important to ensure the right to human dignity, since this intervention is unpleasant for the patient due to his uncovered lower body.
3.	Identify the patient and inform him about the necessity and process of the intervention. Check his vital parameters.	The patient's fear can be decreased and his cooperation promoted by this.
4.	Disinfect your hands hygienically, put on rubber gloves and an apron.	Due to keeping the rules of sepsis-antisepsis and your own protection.
5.	Position the patient, raise the headboard of the bed by 30 degrees if it is not contraindicated.	
6.	Fold the bedding back as far as his knees.	This way he is not completely uncovered.
7.	If the patient is not immobile, and can help, ask him to bend the knees while supporting himself on his heels, then raise his hips while you put your non-dominant hand under the patient's waist supporting yourself on your elbow. In case the patient can not move, fold down the headboard of the bed and turn the patient to one side, then powder his lower back and buttocks. Place the bed-pan to the patient's buttocks, fix the bed-pan with one of your hands, while hold the patient's hips with your other hand. Ask him to turn on his back, to position himself comfortably on the bed-pan, then raise the headboard by 30 degrees.	If you support yourself this way, you can lift the patient's hips with less effort. This way he can turn onto the bed-pan more easily. The talcum powder prevents the bed-pan from sticking to the patient's skin. Defaecation is easier with a raised headboard.
8.	Roll the towel and place it under the patient's waist.	It ensures comfort, decreases the lumbar curvature.
9.	Prepare the warning bell and the toilet paper near the patient.	
10.	If it is possible, leave the patient alone for a few minutes, while he is defaecating, then help him wipe the anal area, if necessary (pay attention to the right direction of wiping, i.e. from the pubic region toward the anus).	
11.	Cover the bed-pan with a lid, then encourage the patient to wash his hands by giving him a wash-basin and soap.	In order to prevent the transmission of pathogens.
12.	Observe the emptied stool. If necessary, take some faecal specimen.	Observe whether the faeces has any pathological characteristics (colour, smell, consistency, composition).
13.	Tidy up the patient's environment.	
14.	Treat the resulting waste materials selectively, place the washable bed-pan to the bed-pan washer.	
15.	Perform hygienic hand disinfection.	
16.	Document the procedure.	

The most common *indications* for stoma formation are *colorectal tumours* and *chronic inflammatory bowel diseases* (Inflammatory Bowel Diseases, IBD). According to statistical data, about 15,000 people live with a stoma in Hungary (Nemeth, 2011). In England there are more than 100,000 people with stomas recorded, while in the United States and Canada, their estimated number is a million (Popek, 2010, Burch, 2011).

Historical outlook

Descriptions on opening some section of the intestinal system and the conduction of faeces have been found since the years BC. These early writings refer to interventions with unknown results, carried out for the treatment of bowel obstruction or bowel injuries (Köves, 1997, Burch, 2008).

Reports on successful surgery including stoma formation have been found as far back as the 1700s. Alexis Littre, a French physician and anatomist did a colostoma for an infant with anus atresia in 1710. In 1756 William Cheselden from England applied transversostoma as a surgical solution for a woman, aged 73, who lived on for years after the operation. In 1776 Jean Pillore chose coecostoma to resolve ileus. In 1793 Duret, a French surgeon did a colostoma due to anus atresia for a four-day-old newborn, who then lived on until the age of 45 years. In 1795 Daguesceau made a colostoma for a farmer who used a small leather pouch to hide the stool.

In 1839 Jean Amussat, a French surgeon, reported only 27 cases, out of which six patients survived the surgery, in his summarizing study which examined the stoma formational surgeries performed between 1716 and 1839. The mortality rate was very high due to peritonitis caused by faecal contamination.

Jan Mikulicz-Radecki made a colostoma with a double orifice in 1903. The French Henri Albert Hartmann performed a surgery, an intestinal resection with colostoma formation that bears his name, in 1923. In 1950 the English Bryan Brooke created an eversional ileostoma that was named after him, which greatly reduced the risk of peristomal irritation of the skin. Nils Kock, a Swedish surgeon elaborated the ileostoma method of the continent in 1969 (Köves, 1997, Burch, 2008).

The preparation of the artificial anus in the low back region (Kraske operation, 1885) can be mentioned as an interesting issue, in the course of which the bowel was placed in the sacral region after the removal of the rectum. Psychologically this was less burdening for patients, its care, however, caused great difficulties. Nowadays this type of stoma formational surgery is no longer performed (Dubecz et al, 1997).

Various "upholding" items, containers have been manufactured and applied since 1920s. The first self-adhesive stool containers were made in Chicago in 1944, then their production was started in Europe as well.

Turnbull and Norma Gill started the professional training of nurses on stoma therapy in Cleveland in 1968. Then this area began to develop to become an independent specialized medical area in Europe, also in Hungary since the 1970s (Köves, 1997, Burch, 2008).

The classification of enterostomas

Classification according to sites

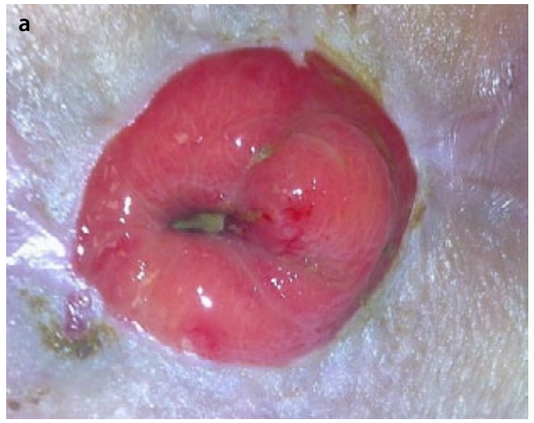
- *Colostoma:* An orifice created on the colon is called colostoma. This can be *coecostoma, transversostoma or sigmoideostoma* in accordance with the involved intestinal section.
- *Ileostoma:* We speak about an ileostoma when the intestinal contents empty through the orifice of the last small intestinal loop extracted to the abdominal wall. It differs from the artificial anal opening constructed on the rectum also regarding the surgical technique and caregiving, because the skin contact of the thin faeces must be prevented. In order to achieve this, an ileostoma raises 2 to 3 cm above the abdominal wall's level of skin, so the stool irritates the skin surrounding the stoma to a lesser degree.
- *Continent ileostoma:* The essence of the surgery is the construction of a pouch (Kock-reservoir), apt for being passed through and emptied with a catheter, which the patient can close with a cover sheet and in the intervals between daily emptyings performed four times a day, the ileostoma is continent, faeces does not evacuate through it.

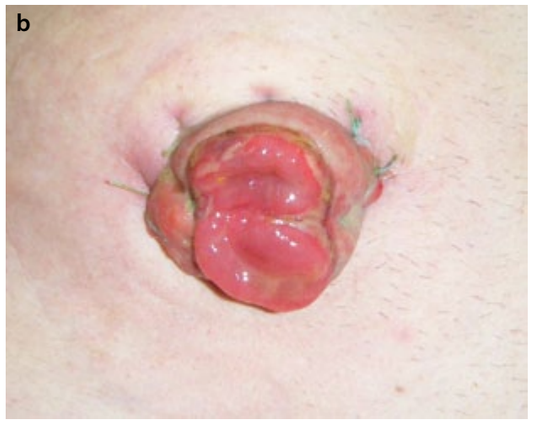
Classification according to duration

- *Temporary stoma:* In case of temporary stoma construction the enterostoma is closed after surgery (usually after 3 to 6 months). Its common indication is load-exemption, which ensures more optimal healing conditions for a newly created anastomosis or for an inflammatory process (Köves, 1997).
- *Permanent stoma:* In case of a permanent stoma, the status can be considered final, the stoma closure is not feasible. This state psychologically puts a much larger burden on the patient, because he must accept his permanently altered body image.

Classification according to forms

- *One-opening stoma:* In case of a one-opening stoma, the oral bowel section is sewn out. The section toward the rectum is removed or sunk in the abdominal cavity. This almost always means a permanent stoma. It is most commonly constructed on the sigmoidcolon *(Picture 4 / a.)*.
- *Double-spouted loop stoma:* In case of a double-spouted loop stoma the bowel loop is raised forward and is either opened or the oral and aboral section is separately spouted *(Picture 4 / b.)*.





Pictures 4. a, b. Colostomys
a) One-opening colostomy, **b)** Double-spouted loop colostomy

The Anglo-Saxon literature also applies Devlin's classification, published in 1984 (Rust, 2007), according to which *input* and *output* stomas are distinguished, depending on whether they are made for the purpose of food intake or evacuation. Accordingly, the scope of input stomas include gastrostomas, jejunostomas and their forms created with the help of endoscopes (Percutaneous Endoscopic Gastrostomy, PEG, Percutaneous Endoscopic Jejunostoma, PEJ), which play an important role in food intake. Ileostoma, colostoma and urostoma belong to the scope of output stomas, which are responsible for emptying.

Enterostoma care

The basic principles of enterostoma care

Stoma construction significantly changes the patient's prior life: there are changes in the patient's physical activity, body image, the body functions are reduced, the provision of proper personal hygiene changes, the demand for it increases (Persson, Hellström, 2002), the patient's earlier lifestyle, leisure activities, sexual behaviour are modified, leisure activities, his social relationships are re-evaluated.

However, upon the comparison of these factors, a difference can be observed between patients with ileostoma or colostoma. As a result of the most common indication of ileostoma, the involved patients belong to the younger population, who have lived in constant stress due to their chronic inflammatory bowel disease earlier and therefore, in case of inflammatory diseases, a stoma may mean "freedom" and a significant improvement in the patient's quality of life compared to their previous condition. A much more restricted life is often replaced by a freer way of life.

The main purposes and outcome standards of stoma care are as follows:

- The promotion of the patient's acceptance of the ostomy and being different.
- The knowledge necessary for self-care is increased.

Further outcome standards are:

- The patient communicates both positive and negative feelings regarding the ostomy.
- The patient demonstrates skills necessary for stomal care, skin care and pouch application.
- The patient knows how to obtain ostomy supplies.
- The patient is aware of the possible complications associated with ostomies and he knows whom to contact if problems arise.

Process standards of stoma care are:

- Consultation with a wound ostomy continence (stoma nurse) nurse.
- Nursing personnel in cooperation with the stoma nurse will:
  - Encourage the patient to communicate fears and anxieties.
  - Assure that the patient will be instructed about the maintenance of the ostomy and the recognition of possible complications.
  - Encourage the patient to actively participate in ostomy care.
  - Assure that the patient will be provided with information regarding available community resources

Nowadays there is a more holistic approach to patient care. According to this approach, the specially trained nurses' (wound ostomy and continence nurse, WOCN) responsibilities include wound care (chronic wounds), and continence management in addition to stoma care.

In summary the following guidelines need to be taken into consideration during the care of an ostomate (a patient with a stoma i.e. with an ostomy) (Ostomy Care and Management (guideline), Toronto, 2009):

1. Making a comprehensive assessment of the patient, which includes the physical and psycho-social factors and the cultural, spiritual and religious norms.
2. Maintaining interdisciplinary cooperation regarding the assessment and the care.
3. The application of a personalized caring plan.
4. The development and continuous improvement of a therapeutic relationship with the patient.
5. The pre-operative care includes the patient's psychological and physical preparation (marking the ideal siting of the ostomy).
6. The emphasized elements of post-operative care are: the prevention of potential post-operative complications and their care, controlling the habit of defaecation.
7. The education of the patient and family members about stoma management.
8. Continuous consultation with a wound ostomy continence nurse.
9. The promotion of adaptation to the altered environment and way of life.

The nursing process of stoma care involves the period before and after surgery (pre- and post-operative treatment) and outside the hospital, the settings where ostomate's care is provided (community care, home nursing care, social services), where a wide range of rehabilitation takes place.

Peri-operative stoma care

The patient may hide many questions and uncertainties which well-trained nurses can answer and provide assistance for, based on the patient's needs and problems. The peri-operative period bears great significance regarding the patient's further quality of life, since it affects the patient's attitude to his ostomy and it provides the foundation for the relationship and the cooperation between the nurse (wound ostomy continence nurse) and the patient.

Pre-operative tasks

Before the stoma formation surgery the nurse should gain information about how much the the patient knows his disease, what his skills and family background are (Pontieri-Lewis, 2006). The assessment of status and nursing anamnesis is very significant, since several factors can affect the patient's later life, lifestyle with the stoma. These factors must be explored and taken into consideration on behalf of nursing.

The following factors are of special importance (Pontieri-Lewis, 2006, Rust, 2007, Vujnovich, 2008):

- general appearance
- the status of the skin, potential disorders (e.g. psoriasis, eczema)
- accompanying diseases (e.g. diabetes)
- disability
- manual skills (e.g. tremor, Parkinson's disease)
- eye-sight
- communication
- psychological status (e.g. depression)
- social aspects
- community resources
- cultural, spiritual factors (a more detailed description is given at the end of the chapter).

Before surgery it is important to educate and inform patients of the expected effects of the surgery that influence defaecation. The consequences of the surgery may be made understandable for the patient visually as well, with the help of charts, photos, educational aids and materials.

The patient should be familiarized with the supplementary accessories, he should be facilitated to try to wear the items to gain experience about the extent and how the applied means alter clothing and different activities (e.g. work, leisure activities, sports). The patient must be provided information about how to obtain the appliances and accessories, as well as support options (such as self-support groups), which he will be able to utilize later.

In addition, patients' attention must be called to *the protection of stoma,* so that he can carry out his work, sports and leisure activities accordingly. Even before surgery the patient must be informed about the necessary pre-operative *healthy diet* and the diet required after surgery (Vujnovich, 2008).

Other than the patient's psychosocial preparation, *the ideal siting for the stoma* is an important task, which is performed by the enterostomal therapist i.e. by the ET nurse.

Upon the selection of the appropriate stoma site the patient's individual requests, the anatomical orientation points, the existing scars on the patient's abdomen, skin creasing have to be considered. Overweight, or patients with artificial limbs or disabilities require special attention.

While marking the optimal site, the patient must be evaluated in the supine position as well as sitting, standing and bending forward. The stoma site should preferably be determined so that it is visible to the patient and its care can be easily implemented (Rutledge et al., 2003, Vujnovich, 2008, Barr, 2008).

The marking of the stoma site can be done by applying a variety of methods (e.g. marking pen, methylene blue tattoo), upon the usage of which efforts should be made to preserve the marking until the surgery, so that it does not become blurred or wear off (Dykes, 2010).

The implementation of the special pre-operative preparation (intestinal preparation, thrombosis prophylaxis, prophylaxis stressulcus) is a nursing task carried out upon the physician's instructions.

Post-operative care

In terms of stoma care, the most important task after the stoma construction surgery is the follow-up of the *stoma (its colour, opening, size, congestion), the fixational suture* and *peristomal skin condition,* in case of two-opening stomas the bridge position, as well as supervising the evacuation and the characteristics of faeces (Vujnovich, 2008).

Normally, the stoma is of light red colour and warm to touch. It shows *signs of necrosis* when it turns black and cold to touch. If the stoma becomes purplish or dark red, blood supply disorders can be suspected.

In the past 60 years there has been a major change regarding stoma size. According to the research done by Vujnovich (2008), while the height of a colostoma was given in 3 to 5 cm in the 1950s, studies performed in 2005 have shown that the height of a colostoma has not been allowed to exceed 5 mm measured from the surface of the skin. This implies that the incidence of stoma complications can be reduced. (More details on this topic are mentioned later in this chapter.)

In case of ileostomas defaecation usually begins in the first 24 hours, when the faeces is thin, regarding its consistency and its quantity can be even up to 800-1700 ml. 500-800 ml is considered a normal daily volume, which has to be checked by measuring the volume upon each time the pouch is emptied (Pontieri-Lewis, 2006, Vujnovich, 2008).

In case of colostomas defaecation generally begins 2 to 3 days after surgery, which results usually in thinner stool, considering its texture, whereas it may even come close to a formed shape later, depending on the location of the stoma.

Emptying and cleaning the stoma pouch

The items to be prepared are:

- toilet paper
- rubber sheet
- trash bag
- bed-pan
- several pairs of rubber gloves
- measuring cup in case of ileostoma

Table 4. Emptying and cleaning the stoma pouch

	Steps	Explanation
1.	Perform hygienic disinfection of the hands.	In order to keep the rules of sepsis-anti-sepsis.
2.	Prepare the environment. Send the visitors out, close the hospital room door, use a folding screen. Prepare the necessary items. If possible, perform emptying the stoma pouch isolated from the other patients. If there is no way to do that, carry out the task considering the patient's dignity	Ensuring the right to human dignity is important.
3.	Prepare the patient: identify, inform and reassure him. Assess his vital parameters. Inform the patient about the essence and process of the procedure, if possible use educational materials. Make sure that the patient understands what he has heard. Ask the patient to cooperate while keeping the principle of graduality.	It helps the patient encounter the stoma and the faeces being evacuated through the stoma.
4.	Place a rubber sheet or an isolation sheet under the patient for the protection of the bedding. If you do the arrangements at the toilet, make the patient sit either on the toilet or on a little chair opposite the toilet bowl in a way that the pouch is over the toilet. Prepare all necessary items directly next to the patient.	The thorough and appropriate preparation of the patient increases his sense of security. So that the process does not take longer than necessary.
5.	Put rubber gloves on.	You have to protect yourself from the body discharge.
6.	Put isolation around the stoma on the abdomen.	It protects the abdominal skin and also the bedding.
7.	Remove or open the closure clapping of the pouch.	The clappings prevent the faeces to flow out of the pouch.
8.	Open the tip of the pouch and carefully release the stool from it.	This is how faeces can be removed from the pouch. In case of pasty stool, apply some gentle massage-like pressure on the pouch in order to remove the stool.
9.	Open the bottom of the pouch and keeping it apart, wipe it.	The stool remains can be removed this way.
10.	Flush or empty the bed-pan.	It decreases odour and the patient's sense of decency.
11.	Perform hygienic disinfection of the hands and put clean rubber gloves on.	It decreases the transmission of infection.
12.	Either put the pouch back or close the closure clapping.	It prevents the faeces to flow out of the pouch.
13.	Wipe the pouch on the outside as well.	In order to remove potential contamination. This is how the clensing of the pouch is finished.
14.	Tidy up the patient's environment. Treat the resulting waste materials selectively. Use an air freshner if necessary, then put the items back where they belong.	Waste management according to the rules is a hygienic regulation and also of economic considerations.
15.	Perform hygienic hand disinfection.	It decreases the transmission of infections.
16.	Summarize everything you have said to the patient and ask him if he has any questions.	Phrase what you tell the patient understandably and answer his questions clearly.
17.	Document the procedure: your experiences, the time of defaecation, the characteristics of the stool, its consistency, volume and report the potential problems to the attending physician.	

The exchange of the stoma pouch

The items to be prepared are:

- sterile dressings,
- stomatherapeutic accessories,
- paste, as needed,
- body temperature water,
- wipes,
- rubber sheet,
- trash bag or discharge bowl,
- several pairs of rubber gloves,
- scissors,
- stoma measuring equipment,
- pen,
- measuring cup in case of ileostoma,
- nylon bag.

During each stoma assessment it is important to document:

- the way the stoma looks (colour, size and general appearance)
- the status of the skin
- the faeces being evacuated through the stoma (its consistency and volume).

The application of the accessories

Specially designed medical appliances should be used for stoma care. In Hungary doctors prescribe these appliances, whereas abroad (e.g. in the United Kingdom) eneterostoma therapists (EC nurses) possess the competencies required for this purpose.

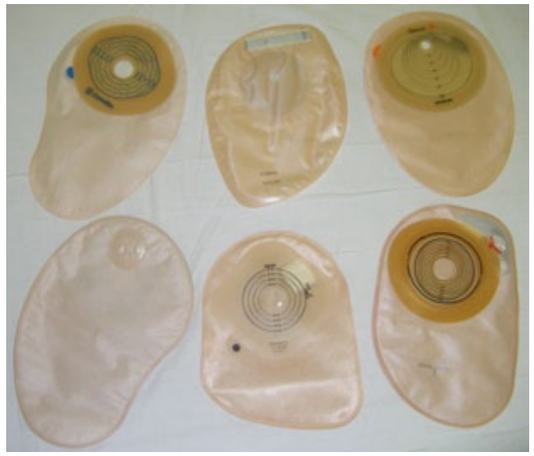
The appliances for stoma care can be categorized the following way:

- One-piece closed appliances *(Picture 5)*
- One-piece open appliances *(Picture 6)*
- The *two-piece system* consists of a base and a pouch that can be attached to it *(Picture 7)*:
- *Accessories,* which enhance the application time of the appliances. (Pontieri-Lewis, 2006)

Table 5. The exchange of the stoma pouch

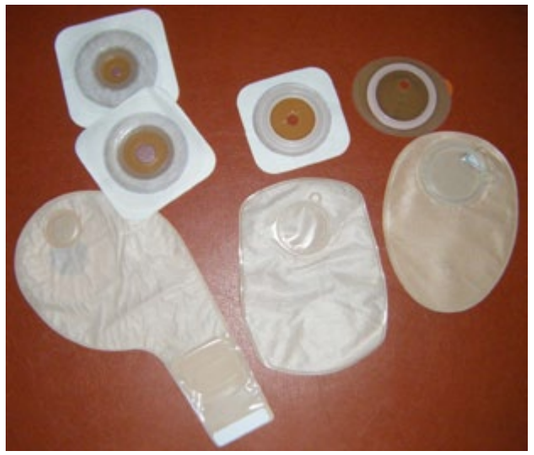
	Steps	Magyarázat
1.	Perform hygienic disinfection of hands.	In order to keep the rules of sepsis-antisepsis.
2.	Prepare the environment. Send the visitors out, close the hospital room door, use a folding screen. Prepare the necessary items. If possible, perform the exchange of the stoma pouch isolated from the other patients. If not possible, perform the task considering the patient'sdignity.	It is important to ensure the patient's right to human dignity.
3.	Prepare the patient: identify, inform and reassure him. Observe his vital parameters. Inform the patient about the essence and process of the procedure, if possible use educational materials. Make sure that the patient understands what he has heard. Ask the patient to cooperate while keeping the principle of graduality.	It helps the patient encounter the stoma and the faeces being evacuated through the stoma.

4.	Place a rubber sheet or an isolation sheet under the patient for the protection of the bedding. If you do the arrangements at the toilet, make the patient sit on the toilet or on a little chair opposite the toilet bowl in a way that the pouch is over the toilet. Prepare all necessary appliances and accessories directly next to the patient.	The patient's thorough and proper preparation increases his sense of security. So that the process does not take longer than necessary.
5.	Put rubber gloves on.	You must protect yourself from body discharge.
6.	Place peristomal isolation on the abdomen.	It protects the abdominal skin and the bedding from contamination.
7.	Empty the pouch: in case of an open pouch, by removing or opening the closure clapping, or by cutting the bottom of the pouch in case of a closed one-part pouch.	This way it can be prevented that the contents of the pouch flow out while the pouch is being removed. In case of an ileostoma it is important to measure the volume.
8.	Remove the stoma accessory. While supporting the abdominal skin carefully push it off the adhesive surface. Throw the used pouch into the trash.	By this you can prevent skin damage. It decreases the smell and the patient's sense of decency.
9.	Carry out hygienic hand disinfection.and put clean gloves on.	It decreases the transmission of infection.
10.	Clean the stoma and the peristomal area. Remove the majority of the contamination with a dry wipe, clean the peristomal area with soapy water or with skin cleansing liquid.	Its purpose is the removal of contamination and the preparation of the skin for using the new accessory.
11.	Prepare the skin and the new accessory and apply it: Measure the diameter of the stoma and according to its size and shape cut out the base sheet or the pouch opening. If necessary, fill the cavities, creases around the stoma with paste, spread it with a wet finger or wet gauze, otherwise the paste is not spreadable. Use a hair-dryer for drying, if necessary. Remove the protective foil covering the adhesive part and apply the base sheet or the pouch. Make sure that the skin is preferably wrinkle-free. Affix the pouch, check if the two-part system is properly adjusted.	It promotes the prevention of complications and safe accessory application if the base sheet or the one-part pouch is cut out to the proper extent. Filling the creases of the skin prevents the accumulation of discharge and by this, the development of dermatitis. The adhesion of the appliance is secure on a completely dry surface. The wrinkles of the skin are also collecting places for discharge. The pouch can easily come off if its adhesion is inadequate.
12.	Tidy up the patient's environment. Treat the resulting waste materials selectively. Use an air freshner if necessary, then put the items where they go.	Waste management according to the rules is a hygienic regulation and also of economic considerations.
13.	Perform hygienic hand disinfection.	It decreases the transmission of infections.
14.	Summarize everything you have said to the patient and ask him if he has any questions.	Phrase what you tell the patient understandably, answer his questions clearly according to your competence.
15.	Document the procedure: your experiences, the time of evacuation, the nature of the effluent, its consistency, volume and report the potential problems to the attending physician.	



Picture 5. One-piece open appliances

Picture 6. One-piece closed appliances



Picture 7. The base sheet of the two-piece appliance with the open or closed pouch, identical with it in size

The patient's education

Documentation is of great significance in the process of stoma care, due to its importance in the follow-up of the patient's condition, care and rehabilitation. The following events must be continuously recorded:

- stoma therapeutic consultations,
- assistance in stoma care,
- the application of the appliances and
- the patient's or the significant other's education regarding self-care, the application of the appliances, reaching out to community resources, the recognition of complications and what should be done in case of complications.

Table 6. The patient's education

	Steps	Explanation
1.	Perform hygienic disinfection of the hands.	To keep the rules of sepsis-antisepsis
2.	Prepare the environment. Send the visitors out, close the hospital room door, use a folding screen. Prepare the necessary items. If possible, perform the exchange of the stoma pouch isolated from the other patients. If not possible, perform the task considering the patient's dignity.	Ensuring the patient's right to human dignity is important.
3.	Prepare the patient: identify, inform and reassure him. Observe his vital parameters. Inform the patient about the essence and the process of the procedure, if possible, use educational materials. Make sure that the patient understands what he has heard. Ask the patient to cooperate while keeping the principle of graduality.	The patient's preparation is promoted by his encounter with the stoma and the faeces being evacuated through the stoma.
4.	Place a rubber sheet or an isolation sheet under the patient to protect the bedding. If you do the arrangements at the toilet, make the patient sit on the toilet or on a little chair opposite the toilet bowl in a way that the pouch is over the toilet. Prepare all necessary appliances and accessories directly next to the patient.	The patient's thorough and proper preparation enhances his sense of security. So that the process does not take longer than necessary.

5.	Put rubber gloves on.	You must protect yourself from the body discharge.
6.	Perform the exchange of the stoma, in the meantime inform the patient about the steps: explain all the steps in detail and ask the patient for feedback on whether he understands what you say and make him carry out the given steps. Observe the stoma and tell the patient what kind of complications may occur and demonstrate them.	The detailed information provided for the patient enhances the patient's knowledge and encourages the patient to perform stoma care independently. In addition, it promotes the recognition of complications in time.
7.	Tidy up the patient's environment. Treat the resulting waste materials selectively. Use an air freshner if necessary, then put the items where they go.	Waste material management according to the rules is a hygienic regulation and also of economic considerations.
8.	Perform hygienic hand disinfection.	It decreases the transmission of infection.
9.	Summarize everything you have said to the patient and ask him if he has any questions.	Phrase what you tell the patient understandably, answer his questions clearly, according to your competence.
10.	Give information to the patient regarding his lifestyle in the home setting, ask for his feedback. Tell him: How to perform the exchange of the appliance. To turn to a doctor if he sees any change about the stoma or the peristomal area. Who to contact in case of a problem. Give him the necessary contact numbers. How he can obtain supplementary medical appliances, what support is provided and where he can get them. Inform him about the ILCO movement, the life of the club and the timing of the meetings. Ask for the patient's approval for patient's visits by ILCO.	Complete information increases the patient's sense of security and cooperation.
11.	Document the procedure: write down the experiences regarding the patient's education and the patient's cooperative willingness in the nursing documentation. Ensure the physician makes the necessary prescriptions and have the statements signed by the patient.	

Stoma care in child care

Stoma care is not completely different in child care. However, there are factors that must be considered to be of utmost importance in order to ensure proper care.

The selection of products differs from that of the adults, in which the following points of view need to be taken into consideration:

- it should be one-piece or two-piece,
- how long the wearing time is,
- it should be flexible,
- how big the size of the opening should be,
- what its material should be like (e.g. latex),
- should it have the shape of a circle or a rhombus,
- what the size and capacity of the pouch should be like.

Table 7. Stoma care in child care – Tips by age groups for emptying and exchanging the pouch

Age group	Tips for emptying the pouch	Tips for pouch exchange
Infants	The tip of the pouch should be on the side, it is easier to empty it that way. With a syringe (in a hospital setting). In nappies (in a home setting), it helps potty training.	Wearing time is at least 24 hours and maximum 2 to 3 days. The tip of the pouch should be on the side for easier emptying. Apply special tying methods, if necessary, so that the baby cannot move the pouch off. Apply the paste from a syringe. Warm up the adhesive sheet.
Small children	At the toilet, before the afternoon nap and the evening bedtime. When toilet trained, sitting on the toilet, or standing in front of the toilet bowl with assistance or independently.	Generally an exchange every 2 to 3 days, the tip of the pouch is parallel to the legs, warm up the adhesive sheet, the child should wear one-piece clothes with an undervest, the child is curious of everything, use attention distraction and the exchange should be done in a playful manner, give a name to the stoma.
Schoolchildren	Sitting on the toilet, or standing in front of the toilet, independently.	exchange is usually done every 2 to 3 days, the development of trust, use a language that the child easily understands, ask for the child's help during exchange, use picture brochures for information, give a name to the stoma.
Adolescents		generally there is an exchange once in 3 to 5 days, developing trust, encourage him to self-care, use a language he easily understands.

Stoma complications

Based on the time of the development of complications, stoma complications can be divided into early and late complications. Their development is often the result of the inadequate siting of the stoma, as it has already been mentioned at the section on selecting the stoma site, but inappropriate care may also be a contributing factor (e.g. the pouch opening becomes too large or too small when it is cut out, or the application of alcohol content products upon skin care). Early complications often require a surgical solution (Gaál, 2010). A very significant proportion of late complications develop within 6 months following surgery (Park et al., 1999).

Early complications can be the following disorders:

- Peristomal skin congestion
- Peristomal abscess
- Bleeding from the mesocolon
- Colostoma retraction
- Para- and peristomal intestinal prolapse
- Necrosis

The following disorders can be late complications:

- Parastomal hernia
- Prolapse
- Stenosis
- Retraction
- Peristomal dermatitis
- Late abscess

Self -Care

Ostomates have special caring needs. In addition to regular medical check-ups, the status of the stoma and also the peristomal skin must be regularly monitored and tasks also include ensuring that the patient can safely carry out self-care and can get back to his former lifestyle as soon as possible (depending on his condition).

Rehabilitation and stoma

Usually the development of a disease affects the individual and the life of the family as well. While in case of acute illnesses less stress prevails and the given illness does not require a major change in lifestyle, due to the quick process of the disease, the development of a chronic disease (stoma formation also included) is acompanied by a strong stress effect for the patient and his family, as well as it requires alterations in the former way of life.

Due to the illness, changes are necessary, not only in the physical but also in the social environment surrounding the patient, so

- *in the school environment* in case of a child (e.g. repetition of a year's work may be necessary, a special school must be selected etc.);
- *in the work environment* (e.g. the patient becomes incapacitated, or a family member has to change jobs in order to be able to look after the sick family member);
- and *in the community or social environment* (e.g. the patient cannot continue his former sports activities).

Consequently ostomates must adapt not only to their own body-image changes, but also to the options induced by their disease and given by their environment. The family and social relationships are re-evaluated. There are changes in the patient's habits, sexl life, his social relationships may narrow, which can lead to social isolation, which in turn increases the potential incidences of loneliness, depression (even suicide) and harmful addictions (e.g. alcohol, drugs).

The patient's health becomes dependent on health care services, which is the consequence of the surgery, post-oper-

ative treatments, the regular check-ups. This, however, has financial implications (e.g. travelling, getting out of work, medication application etc.), even if the necessary supplementary appliances and accessories are provided under the reimbursement of social security payments.

Due to ensuring holistic care, the rehabilitation of ostomates requires an interdisciplinary approach, in which stomatherapy nurses, community nurses, dietitians, surgeons, oncologists, general practitioners and also psychologists play a significant role. Furthermore, this important role refers to the manufacturers and distributors of supplementary appliances and accessories as well.

The nurses participating in ostomates' care need to know the patient and his family, and physical, psychological and social effects caused by the disease in order to be able to carry out their job with the proper circumspection, in accordance with the highest professional standards, which also involves the expectation that their communication should enhance efficient and successful rehabilitation.

Controlling the rhythm of defaecation

Certain groups of patients who live with a stoma have the opportunity to have their faecal evacuation controled in some way. The closer the construction of the artificial opening to the rectum , the more likely it is that the patient's stool will be of a formed consistency.

The defaecation can be controlled with *enemas (irrigation)*. If the patient is physically and intellectually capable of learning the process of irrigation and is willing to acquire it, then the patient must be offered this opportunity and must be taught about it. The earliest time it could take place is 8 to 12 weeks after the surgery. The application of irrigation must be consulted with the surgeon and the internist.

Irrigation is taught to the patient by trained stomatherapy nurses. The correct application of irrigation, performed with the proper technique is completely painless and harmless to the patient. Medical supplies manufacturers offer special appliances and accessories for irrigation which are designed specifically for stoma irrigation. Irrigation is not a cleansing enema. We want the bowel to empty when it is suitable for the osotmate, so the operation does not necessarily require a lot of fluid. The amount of liquid to be used must be determined individually for each person.

The irrigation set contains the following items:

- water container,
- tap regulating water flow,
- irrigation cone,
- pelotta,
- draining foil bag (for a one-piece or a two-piece pouch system),
- clamps,
- set holder,
- ostomy belt.

The protocol of irrigation

The method can be taught to the patient as an outpatient. If possible, the best place for it is the patient's home. The patients can perform the irrigation in his home every morning, which takes approximately an hour and this way he is relieved of the defaecation problem for the whole day. The stomather-

Table 8. Irrigation process

	Steps	Explanation
1.	Perform hygienic disinfection of the hands.	It is important to ensure the patient's right to human dignity.
2.	Prepare the environment. If the patient is hospitalized, then carry out the irrigation in isolation of the other patients, preferably in a separate room with a toilet, if possible. Irrigation is done in the patient's home setting or at an outpatient's facility 8 to 12 weeks after the surgery.	It is important to ensure the patient's right to human dignity.
3.	Prepare the patient: identify, inform and reassure him. Observe his vital parameters. Inform the patient about the principle and process of the procedure, if possible, use educational materials. Make sure that the patient understands what he has heard. Ask the patient to cooperate while keeping the principle of graduality.	The patient's preparation is promoted by his encounter with the stoma and the faeces being evacuated through the stoma.
4.	Carry out the preparation of the irrigation appliance: Close the closing valve of the container. Fill the water container with water at the right temperature (37°C) and in the proper amount (depending on the patient's physical build-up 750-1250ml). You can check the right temperature by hand or the temperature control of the container. Hang the bag at least 45cm higher than the stoma orifice.	 So that the water cannot flow out. So that the water is not too hot and it does not damage the bowel. In order to ensure better gravitational flow.
5.	Carry out the somatic preparations: If you do the arrangements at the toilet, ask the patient to sit on the toilet or on a little chair opposite the toilet bowl in a way that the pouch is over the toilet. Prepare all necessary appliances and accessories directly next to the patient.	The thorough and proper preparation of the patient increases his sense of safety. So that the process does not take longer than necessary.
6.	Put rubber gloves on.	You have to protect yourself from body discharge.
7.	Place isolation around the stoma on the abdomen.	It protects the skin of the abdomen and also the bedding from contamination.
8.	Remove the stoma appliance, avoid any damage to the skin. Support the abdominal skin and carefully push the appliance off the adhesive surface. Throw the used pouch into the trash.	This way you can prevent the skin from being damaged. It decreases the odour.
9.	Clean and dry the stoma and the skin the usual way.	It removes contamination.
10.	Put the pelotta around the stoma and fix the ostomy belt on the patient's waist.	The encounter of the irrigation water and the skin must be prevented as much as possible.
11.	Put the lower end of the pelotta to the toilet bowl or to the bed-pan.	So that the evacuating irrigation fluid can flow in there.
12.	Apply the proper lubricating gel on the irrigation cone and direct it into the stoma.	Lubrication prevents the bowel from being damaged, the shape of the cone slips as far into the stoma as necessary.
13.	Open the water regulator and slowly (5-6 sec) let the water flow in. After having the whole amount of water flowed in, some motion is recommended.	The purpose of the procedure is to make the potentially hard consistency faecal content at the stoma entry evacuate. The slow in-flow of fluid does not cause abdominal cramps. In case abdominal cramps occur after all, encourage the patient to breathe in deeply, with which he can decrease the intensity of the cramps. If it does not help, stop pouring the fluid in for a short time. The procedure may be continued after 3-4 minutes. In the meantime the irrigation bag does not have to be closed and opened repeatedly. It helps emptying.
14.	Observe the evacuating faecal content.	The return water and the faeces shows the efficiency of irrigation.
15.	Get the tip of the pouch out of the toilet bowl or the bed-pan and rinse it or empty it.	It prevents spreading the faecal content and soiling the patient's clothes and environment.
16.	Wipe the tip of the pouch and close it.	Megakadályozza a széklet szétkenését, a beteg ruházatának és környezetének beszennyezését.
17.	Encourage the patient to move in the next 30-45 minutes.	The efficiency of irrigation and evacuation is promoted by the patient's movements.
18.	Repeat steps 10, 13 and 14.	This way it is ensured that the fluid remaining in the bowel is emptied along with the faecal content.
19.	Take off the ostomy belt together with the pelotta.	The process of irrigation is finished with this.
20.	Carry out the placement of the stoma appliance according to the instructions given earlier.	With this the process of stoma care is finished.

21.	Tidy up the patient's environment. Treat the resulting waste materials selectively. Use an air spray if necessary, then put the items back where they go.	Waste management according to the rules is a hygienic regulation and also of economic considerations.
22.	Carry out hygienic disinfection of the hands.	It decreases the transmission of infections.
23.	Summarize everything you have said to the patient and ask him if he has any questions.	Phrase what you tell the patient understandably, answer his questions clearly, according to your competence.
24.	Document the procedure: your experiences, the time of evacuation, the nature of the stool, its consistency, volume and report the potential problems to the attending physician.	

apy nurse may check how the patient performs the irrigation and corrects the errors and they discuss the arising problems from time to time.

The significance of self-support groups

If there is a need from the patient's part, it may be useful for them to meet and talk to other fellow-ostomates. Meeting other patients who are in the same boat, which could start as early as before the surgery, may mean a great help for patients, because by this, it can be demonstrated to them how to live a complete life with an ostomy. Gathering into self-support groups and clubs has spread, which does not only provide an opportunity to raise and discuss common problems and possible solutions, but it also means advocacy for ostomates.

The significance of transcultural nursing in stoma care

In the course of stoma care, issues such as cultural and religious views and other beliefs that affect the patient's life must be taken into consideration. A prepared nurse faces the factors that have to be handled during the patient's care as early as upon the assessment of the nursing anamnesis.

Religious and other cultural groups play a significant role in the degree of accepting ostomy, since by strengthening the sense of belonging together, with their help, the patient's social and psychological reconciliation can be expected.

Madeleine Leininger's theory, which highlights the cultural diversity and universality of care, has brought rather striking changes among the views related to nursing and nursing models.

As already emphasized, the accurate assessment of nursing history plays a significant role in the care of ostomates in being able to ensure the highest quality of the patient's further nursing care, as much as possible. To do this, it is also necessary to examine and then take into account the following influencing factors, namely the patient's cultural background (e.g. customs, values, communication, socialization), socioeconomic factors (e.g. family structure, financial social status, education, available community resources, financial support), physiological factors (e.g. anatomical or racial characteristics, developmental disorders, skin colour) and psychological (including spiritual) factors.

The application of nursing philosophies in ostomy care

The nurse and the patient / client relationship develops and unfolds in a well-organized, systematic and problem-oriented system, in which determining the theoretical bases and the selection of the appropriate nursing philosophy and nursing model are of utmost importance. Regarding a patient's care, nurses can select the most appropriate nursing model on the basis of the knowledge about them.

Caring for ostomates requires complex nursing activities, since:

- the surgery affects the patient's basic needs, which must be met;
- the formation of a stoma results in a change in the patient's body image, which requires that the patient learns how to care for it;
- alterations may occur regarding the patient's quality of life (e.g. changes in dressing habits, leisure activities etc.);
- the ability to adapt to the changed environment may result in the narrowing of social relationships, which can lead to the development of depression;
- the care of ostomates takes place in different areas of health care (hospital, community and home care) depending on the patient's status being temporary or permanent;
- examining the status of ostomates in terms of prevention (primary, secondary, tertiary), education about a healthy life style (e.g. dietary habits), screening (e.g. colon cancer screening), surgical solutions (e.g. stoma construction) and rehabilitation (e.g. ostomy care, support groups) are available;
- different cultures and religious traditions affect cooperation with the patient and emphasize individual care.

Regarding the above mentioned issues as well, the care and nursing of ostomates requires a holistic approach, in the centre of which the patient / client himself stands amidst the influencing effects of the surrounding environment. In the course of caring for ostomates, nurses can choose from the applicable nursing models accordingly.

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26. Oxigen Therapy

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Anatomical and physiological introduction:

The task of the respiratory system is to provide external respiration, that is, to exchange oxygen in the alveoli from external air with carbon dioxide in the capillaries of the surface of the alveoli from the bifurcation of the pulmonary trunk. The upper (nose, nasal cavity, pharynx) and lower (larynx, trachea, primary bronchi, bronchioles, alveoli – lungs) respiratory tracts take part in this process. Besides respiration, the respiratory system plays a role in olfaction, temperature control, vocalisation and in the tone of the voice.

Respiration means the intake of oxygen (O_2) and the release of carbon-dioxide (CO_2). An average resting adult human takes in 250 ml oxygen physiologically, and produces 200 ml carbon-dioxide per minute. The respiratory cycle is made up of an inspiration and an expiration phase. During each cycle 500 ml air flows into the lungs then leaves it. The respiratory rate per minute in resting position is 14–16. The product of the former two is the respiratory minute volume, which is 7–8 l/min on average in resting position.

The gaseous exchange between external air and the alveoli of the lungs, and between the alveoli and the blood is called external respiration. Internal respiration includes gaseous exchange between blood and cells, and cellular respiration.

In consequence of the activity of the muscles the thoracic cavity enlarges in all three dimensions during inspiration, thus the internal pressure decreases 1-3 mm Hg below atmospheric pressure, as a result of which air flows into the lungs, that is, to the direction dictated by the difference in pressure. At expiration the muscles relax and the thoracic cavity reduces in all dimensions, so its pressure is increased 1-3 mm Hg above the atmospheric pressure, and the air leaves the lungs.

The lung volumes and lung capacities can be measured with spirometry, and they include the following:

Table 1. A tüdő levegőtérfogatai

Volume or capacity	Volume
Functional residual capacity – the volume of air present in the lungs at the end of passive expiration	2500
Tidal volume – air volume inhaled at a single inspiration	500
Inspiratory reserve volume – the maximum amount of air that can be inhaled by forcible inspiration	2000–2500
Expiratory reserve volume – the maximum amount of air that can be exhaled by forcible expiration	1000
Residual volume – the amount of air remaining in the lungs after maximal expiration possible	1500
Vital capacity – tidal + inspiratory reserve + expiratory reserve volumes	3500
Total lung capacity – tidal + inspiratory reserve + expiratory reserve + residual volumes	5000–5500
Inspiratory capacity – tidal + inspiratory reserve volumes	2500–3000
Expiratory capacity – tidal + expiratory reserve volumes	1500

Gaseous exchange takes place between external air and the alveoli. By inhalation and exhalation air flows from the atmosphere to the lungs and then back to the atmosphere accordingly. The physiological significance of the airways is the following: warming up, cleaning, flowing and humidifying the inhaled air. When it reaches the alveoli, the inhaled air is at core temperature, 36,7±0,3 °C. The hairs in the nostrils and the ciliated epithelium and bronchial mucosa of the bronchial system take part in cleaning inspired air. Nasal cilia filter larger dust grains, while smaller ones adhere to the mucus, then the mucus is directed upwards to the pharynx by the cilia, which is then either swallowed and therefore gets into the stomach, or is expectorated. Airflow is laminar but turbulent flow also can occur in the airways. Air is warmed and humidified simultaneously, thus the air reaching the alveoli has a water vapour pressure of 47 mm Hg.

Respiratory tracts are regarded as anatomical dead space, since approximately 140 ml of air present here does not take part in gaseous exchange. There also exists a physiological dead space, which means the anatomical dead space and the alveoli not taking part in the gaseous exchange together.

Gaseous exchange is a process of diffusion between alveoli and capillaries, driven by partial pressure difference between alveolar air and the plasma of the capillaries.

Partial pressure values of gases in the respiratory system are shown in the following chart:

Table 2. A légzési gázok parciális nyomásértékei (Hgmm-ben megadva)

Gas	Alveolar air	Arterial blood	Venous blood
PO_2	100 mm Hg	95 mm Hg	40 mm Hg
PCO_2	40 mm Hg	40 mm Hg	46 mm Hg

Gas transport in the blood is possible in different forms. Both respiratory gases can be transported in a chemical bond with haemoglobin, or physically dissolved in plasma. Carbon-dioxide also can be found and transported in bicarbonate form in the plasma.

Table 3. Oxygen distribution by respiration

Oxigénmennyiség (ml)	On the inspiration of air	On the inspiration 100% O_2
In the lungs (FRC)	450ml	3000ml
In the blood	850ml	950ml
In the tissues, dissolved or bound (FRC)	250ml 1550ml	300ml 4250ml

The aim of oxygen therapy

Administering oxygen in a higher concentration than the oxygen concentration of atmospheric or room air in order to prevent/treat the symptoms of hypoxia. Usually oxygen therapy is necessary when PaO_2 is below 60 mm Hg or SaO_2 is below 90%.

Assessing oxygenation:

Both invasive and non-invasive examinations are available for measuring the patient's oxygenation, such as pulse oximetry and blood gas values.

The forms of oxygen therapy

- Long-term;
- during physical activity;
- decreasing acute shortness of breath

During oxygen therapy an accurate and controlled regulation of flow rate and FiO_2 and the humidification and warming of the oxygen are necessary in order to meet the aims of the therapy and to prevent complications.

Oxygen delivery devices:

- nasal cannula
- nasal catheter
- simple face mask
- Face mask with reservoir bag
- Venturi mask
- Aerosol mask
- T-piece
- CPAP systems

Oxygen resources

- central oxygen supply devices
- oxygen cylinder
- oxygen concentrator
- oxygen tank

Central oxygen supply devices

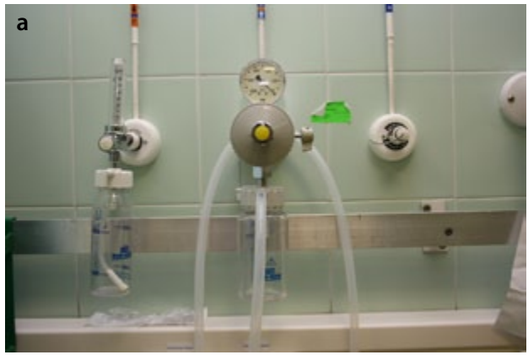
The oxygen stored in a tank or cylinder manifold is delivered to its destination through a pipeline system established in the medical unit. Oxygen dispensers or breathing devices can be connected to the established supply points. The oxygen dispenser is equipped with a humidifier and a flow-meter, the oxygen can be dispensed at a rate of 0-15 l/minute, and can be controlled optically well.

Oxygen cylinders

It is a type of oxygen delivery also used by medical institutions in the absence of central oxygen supply systems and during transporting patients. Concerning home oxygen therapy it is still the most frequently applied device in Hungary. The patient can inhale the necessary amount of oxygen with the help of an inserted pressure reducer. A flow-meter and humidifier are also necessary, and it is advisable to have a spare cylinder on hand.

The cylinder must not be exposed to direct heat. Smoking and free flame are not allowed in the room where the cylinder is stored, and the use of electric devices near the cylinder is not permitted. Do not touch the cylinder with oily or greasy hands. The valve of the cylinder has to be closed after use. In case of fire the cylinder must be closed and removed if possible. Make sure that it cannot tip over and store at a temperature below 50 °C.

The nurse must check the colour code before administering oxygen, and in case of replacing cylinders the nurse must supervise the assembly in person!



Pictures 1. a, b. Central oxygen supply device with flow-meter and humidifier

Oxygen concentrator

It is an increasingly widespread method for in-home oxygen treatment. Oxygen concentrators clean room air with macroscopic filters, then capture nitrogen, carbon-hydrogens and vapours from the air and produce high-concentration (90-95% at low flow rate) oxygen. The patient needs to prepare an oxygen cylinder as well in case of electricity cuts.

Oxygen tank

Oxygen can be stored in greater amounts in liquid form cooled to -183 centigrades. Several different sizes are available (e.g. 2-3-4-kg oxygen tank shoulder-bags with enough oxygen for 8 hours at 2l/minute flow rate). The device has been available since 2004 in a limited amount.

Airway adjuncts

Oropharyngeal airway adjuncts

A common criterion of these devices is that they are administered through the oral cavity and terminate in the pharynx. Therefore they are able to provide patent airway (if it is obstructed by the pathological position of the radix linguae), however, they are not able to maintain it for a long time since they cannot give protection against the aspiration of stomach contents, so this must be taken care of when it is applied (e.g. with recovery position).

Nasopharyngeal devices

In contrast with oropharyngeal tubes they are inserted through the nostrils. The tubes are usually made of soft rubber, their external end is flared, the other end is slanted and contacts the back of the throat, thus they are not suitable for maintaining a patent airway.

Supraglottic airway devices

All these devices can transport air to the respiratory tracts without being led through the glottis, because they terminate above the larynx, in a supraglottic position.

Picture 2. Guedel airway insertion

Table 4. Guedel airway insertion

	Intervention	Explanation
1.	Hygienic hand disinfection	In order to comply with asepsis-antisepsis rules
2.	Prepare the room (hospital ward room, examination room) for the procedure. Provide adequate room temperature.	
3.	Prepare all the equipment necessary for the procedure.	
4.	Verify the identity of the patient and inform the patient on the necessity and process of the procedure.	This can reduce the patient's fears and contribute to co-operation.
5.	Carry out hygienic hand disinfection and put on rubber gloves.	
6.	Position the patient: lay the patient in supine position, recline the head if necessary and subluxate the mandible (Esmarch-Heiberg manipulation)	
7.	Choose the correct tube size: measure the distance between the lips and the angulus mandibulae with the Guedel tube by holding it in its final position	Only the insertion of the correct size is acceptable. Inserting too short or too long devices can cause harm to the patient! (See below)
8.	Open the patient's mouth with one hand	
9.	Make sure that there is no foreign body in the mouth cavity that might be pushed deeper. If there is such a foreign body then remove it before the insertion of the device!	A foreign body penetrating deeper during insertion narrows the airways and leads to a result contrary to the goal of the procedure.
10.	Insert the airway in the mouth upside down until the border of the hard and the soft palate	This positioning reduces the risk of injuries
11.	Rotate the Guedel airway 180 degrees axially	The device is in its final position.
12.	Push the device further until its edge reaches the teeth, i.e. to the back of the throat.	It prevents the root of the tongue from obstructing the airways when lifted from the back of the pharynx.
13.	Make sure to maintain patent airways e.g. apply recovery position.	Guedel airway is not suitable for maintaining patent airways!
14.	Check airway patency and respiration!	Primum nil nocere! (Above all: do no harm!)
15.	Clean up in the patient's environment	Clean up the ward/examination room in accordance with the regulations of managing hazardous waste and waste storage.
16.	Collect any waste selectively	
17.	Carry out hygienic hand disinfection	
18.	Record the procedure	

Combitube

Combitubes or esophageal-tracheal combination tubes (oesophago-tracheal combitube - OTC) belongs to the type of blind insertion airway devices (BIAD), and they only can be regarded as supraglottic devices if the tube ends in the esophagus.

Laryngeal tube

This device morphologically is comparable to combitubes (or endotracheal tubes), but its working principle – as an actual supraglottic device – reminds of that of laryngeal masks (see below).

Laryngeal mask airway (LMA)

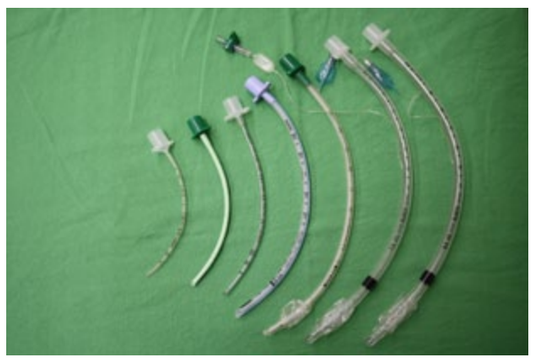
Laryngeal masks (LMA) are supraglottic airway devices. They are similar to face masks in their construction and working principle, but while face masks fit onto the patient's face so as to provide air, LMA is inserted into the larynx with an elliptic cuff. It is considered safe even when used by inexperienced medical staff (either doctors, nurses or paramedics).

Endotracheal tube

Endotracheal tubes (ETT) can be applied either orally or nasally, and the specially constructed tubes are suitable for prolonged ventilation. Traditional ETTs are single-lumen tubes, but in case of pulmonary operations double lumen tubes can provide separate-lung ventilation as well.

Intubation

During endotracheal intubation a special tube (endotracheal tube – ETT) is inserted in the trachea in order to provide effective ventilation together with maintaining the patency of the respiratory tracts and preventing aspiration of stomach contents. This is ensured with a cuff at the distal end of the ETT which has to be inflated with air.



Picture 3. Endotracheal tubes in different sizes

Complications of endotracheal intubation

Traumatic complications:

- Mucosal bleeding along the route of insertion (oral cavity, nasal cavity, pharynx)
- Injuries induced by inappropriate tube position: if the ETT is not positioned deep enough, it can lead to the injury of the vocal cords. For example if the cuff is inflated in the area of the glottis.
- Laryngoscope-induced injuries: incorrect techniques can lead e.g. to the injury of the arytenoid cartilage, which causes glottis oedema resulting in significant airway stenosis on extubation.

Complications resulting from incorrect tube position:

- Oesophageal intubation: its main risk is the aspiration of stomach contents due to resultant vomiting.
- Intubation of the main bronchus: too deep tube position reaches mostly the wider and acclivous right main bronchus.

Reflexes complications:

- The most frequent is a parasympathetic (vagal) response to the incorrectly used spatula lifting the epiglottis and contacting the glottic surface, which lead to bradycardia, hypotension, or even to circulatory arrest.

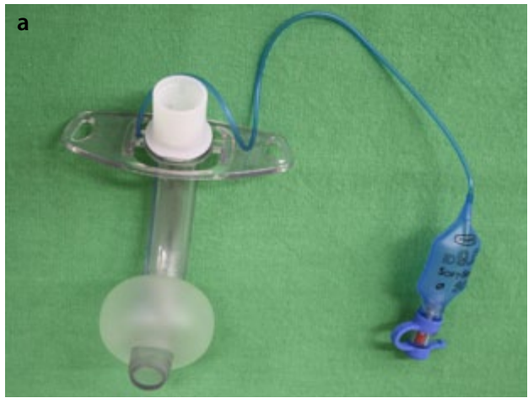
Tracheostomy tubes

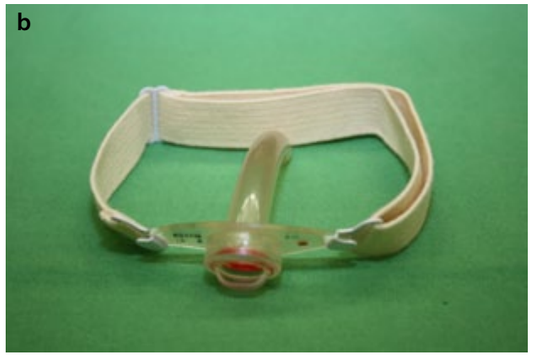
Both single and double lumen tracheostomy tubes exist, curved or angled, and in varying sizes. They can be available with a cuff (recommendable with the use of ventilators) or without a cuff (used for patients who are ready for decannulation (removal of tracheostomy tube) , before decannulation, in case of tracheal problems). In case of tubes without cuff patients can eat per os (by mouth), and they may be able to speak without any auxiliary device.

It is very important to fasten tracheostomy cannulae properly with the neck plate included in the tube set. It must not be too tight, otherwise it may cause decubitus and prevent a. carotid circulation.

Possible complications related to tracheostomy:

- occluded tube
- accidental removal of the tube
- bleeding
- localised infection
- pneumonia
- tracheitis
- trachea injuries
- tracheoesophageal fistula
- tracheal stenosis
- reduced communication





Pictures 4. a, b. Tracheostomy cannulae

Cannula management

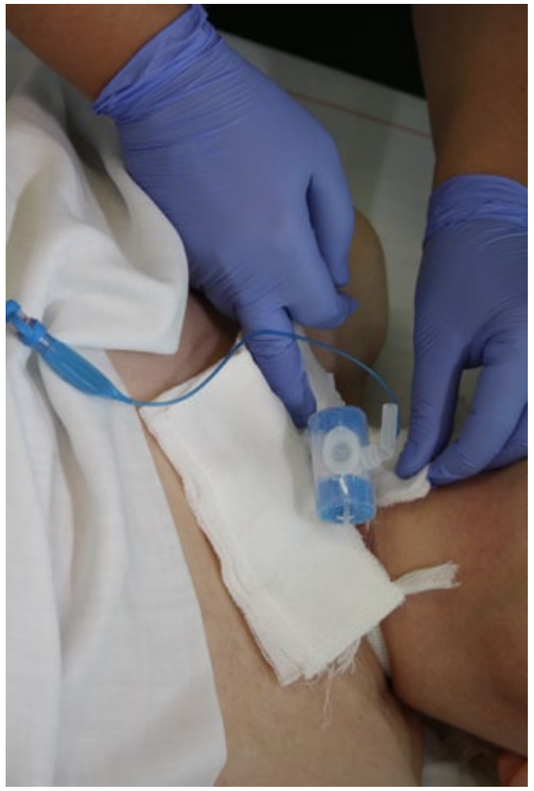
Suctioning from the tracheostomy tube (see below: removal of mucus from the respiratory tract – tracheal suction; Suction guidelines).

The cleaning of double-lumen tracheostomy:

In case of re-usable cannulae the inner cannula must be cleaned every 2-3 hours for two days, after that once in every shift or as necessary. After the removal of the inner cannula it has to be soaked in hydrogen peroxide, then cleansed with a brush, rinsed in sterile distilled water, dripdried on a gauze sheet and then replace it. If the patient is on ventilator, a spare inner cannula can be used on replacement so that the ventilator can be connected. According to certain guidelines the inner cannula also can be washed under cool running tap water (hot water causes protein precipitation).

Skin care/wound care:

The surroundings of the cannula around the tracheostomy neck plate are to be covered with a cut, sterile gauze sheet. When replacing the used dressing fasten the tube with one hand in order to prevent removal. The surroundings of the stoma can be treated with hydrogen peroxide or physiological saline.



Picture 5. Wound management of tracheostomy cannulae

Removal of mucus from the respiratory tract – tracheal suction

The goal of tracheal suction is to remove mucus and/or aspiration from the pharynx and the trachea which cannot be removed by the efforts of the patient and may cause distress or physiological trauma (e.g. deteriorating blood gas values, reduction in oxygen saturation (SaO2), increased respiratory rate), and in order to improve respiratory functions.

Suction is allowed to be performed only if other, less invasive methods have proved inefficient and if the mucus can cause physiological damage. The method includes the insertion of a suction catheter either through the nose (nasotracheal suction), through the mouth (orotracheal suction) or through an endotracheal or (mini)tracheotomy tube.

Instillation of physiological saline

It is a frequent method to instil isotonic saline before suction so as to dilute mucus in the respiratory tract and to assist suction. However, the practice of instilling physiological saline is not fully established; it is frequently applied in certain medical units, while less frequently in others. javascript:newshowcontent('active','references');

Suction with adequate technique for proper time:

To reduce suction-induced hypoxaemia in patients suffering from respiratory inadequacy the most efficacious method is to deliver 100% oxygen prior to suctioning, then suction for at most 15 seconds.

Inserting the suction catheter to an adequate depth:

Insert catheter until the patient begins to cough or resistance is met; it means that the catheter has reached the bottom of the tracheal tube. It may be necessary to place it even deeper in case of paralysed or sedated patients. Never push the suction catheter any deeper if resistance is met (bifurcation) because it involves the risk of inserting the catheter in the right main bronchus, which reduces the efficacy of the suction.

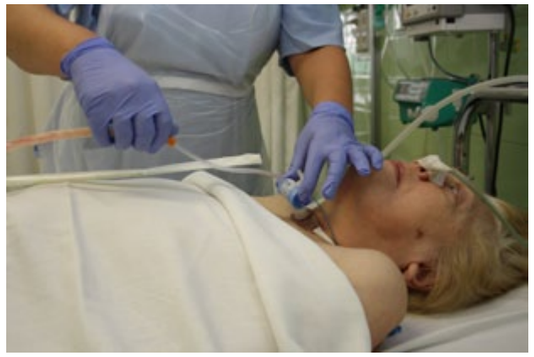
Types/ forms of suctioning:

Open tracheal suctioning system

During application of the traditional open suction system the suction catheter is connected to the end suction device then inserted into the (artificial) airway, and vacuum is applied when the catheter is being pulled out.

Equipment necessary for the procedure:

- pulse oximeter
- disposable non-sterile rubber gloves
- sterile rubber gloves
- protective apron, protective eyewear, nose/mouth mask
- appropriate size suction catheter



Picture 6. Suctioning from a tracheostomy tube

Table 5. Properties of airway mucus

- Profuse, high volume
- Slight
- Mucopurulent, puriform (green or yellow) in case of infection
- Foamy – in case of pulmonary oedema
- Bloody (in case of injuries of the mucosa of the trachea) -haemoptoe
- Thick, sticky secretion
- Thin, watery secretion
- Blue-red – pulmonary infarction
- Rusty brown – pneumonia
- Pink – lung tumour
- Bright red – active bleeding, TBC

Table 6. Trachealeszívás folyamata

	Intervention	Explanation
1.	Hygienic hand disinfection	In order to comply with asepsis-antisepsis rules
2.	Prepare the room (hospital ward room, examination room) for the procedure. Provide adequate room temperature.	
3.	Prepare all the equipment necessary for paracentesis.	
4.	Verify the identity of the patient and inform the patient on the necessity and process of the procedure.	This can reduce the patient's fears and contribute to cooperation. Tell the patient that the procedure probably will be unpleasant but quick. Inform the patient that the procedure expectedly will be necessary to repeat. Depending on the patient's consciousness, explain that she/he may need to cough during/after the procedure for a short time. If possible try to apply some less invasive method for removing phlegm before suctioning.

5.	If possible, position the patient upright and put on the pulse oximeter.	It allows maximal dilation for the lungs and this position makes it easier to cough as well.
6.	Check the patient's respiratory parameters; saturation test.	Assessment of the patient's condition has to be carried out before and after the procedure
7.	Perform hygienic hand disinfection, then put on non-sterile rubber gloves, protective apron and protective eyewear	In order to prevent cross-infections
8.	Check suction (connection, suction) and adjust suction power.	Too powerful vacuum may lead to traumatic injuries of the airways
9.	Pre-oxygenation or pre-oxygenation and opening the lungs (PEEP>5 cmH_2O) for min. 30 seconds, max. 2 minutes	In order to prevent suction-induced hypoxaemia. The FiO_2 can range from 21–100% depending on the patient's condition and primary diseases; see oxygenation
10.	Put a sterile rubber glove on the dominant hand with which you will pull the catheter out, and put a non-sterile rubber glove on your other hand.	In order to prevent cross-infections
11.	Open the sterile suction catheter with sterile rubber glove on	
12.	Connect the sterile suction catheter to the tubing of the suction device (Y connector)	In certain suction catheters have an integrated vacuum relief opening (thumb control suction valve) which needs to be covered to produce vacuum; otherwise a connector is necessary. The suction tubing is attached to one end of the Y connector, the sterile suction catheter is attached to the other one, suction is performed by covering the third end with a finger.
13.	Disconnect ventilator from the endotracheal/ tracheostomy tube (if the patient receives artificial ventilation)	
14.	Place the catheter in the oral cavity/nose/artificial airway, but do not apply suction yet	If the system was under suction during insertion, it would increase suction-induced hypoxaemia.
15.	Insert the catheter until resistance is met or the patient starts to cough, then pull back 1 cm and start suctioning.	This can prevent traumatic injuries and the catheter from being inserted in the right main bronchus. In case of tracheostomy tubes a smaller portion of the suction catheter can be inserted in the trachea, since the bifurcation is "closer" to the point of insertion.
16.	Perform suction by pulling back the catheter.	Do not rotate the catheter and do not apply suction for more than 15 seconds. Keep checking on the patient and the parameters, especially oxygen saturation. Do not repeat insertion of the catheter and suction more than twice. Observe the amount and properties of the phlegm.
17.	Connect the patient back to ventilator, or administer oxygen similarly to the pre-oxygenation procedure.	Control saturation with monitoring the parameters; they ought to reach normal (pre-suction) values within 3 minutes.
18.	Rinse the tubing of the suction device	If the tubing is not rinsed it may be obstructed, the discharge can be clogged inside
19.	Handle the suction catheter as hazardous waste	Collect hazardous waste (suction catheter, rubber gloves, apron, mask) in yellow bags with the appropriate sign. If possible, disinfect protective eyewear
20.	Perform hygienic hand disinfection	In order to prevent cross-infections

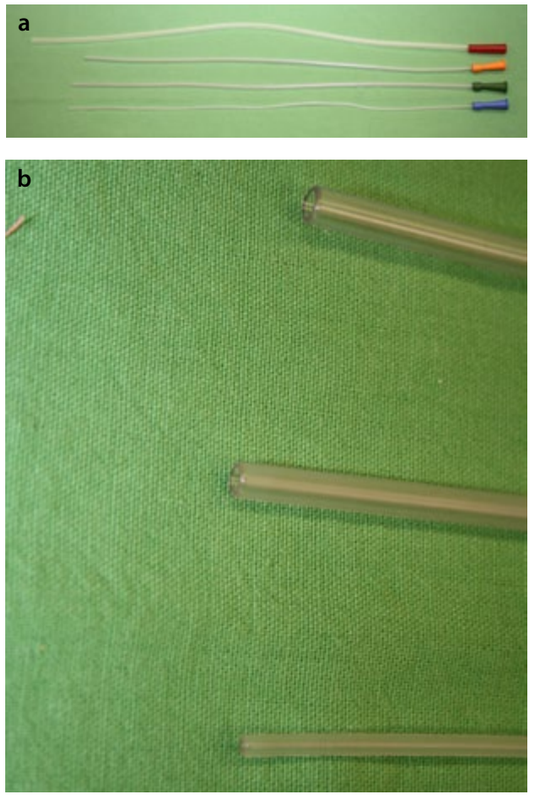
21.	Check patient's parameters	Parameters normally regain their normal (pre-suction) values within 3 minutes; or within 10 minutes in case of cranial injuries – pay extra attention to intracranial pressure in this case
22.	Record the intervention and the properties of the discharge	

Closed tracheal suctioning system

With a closed system suction is performed without interrupting ventilation, in a closed system, through the ventilator circuit.

Possible complications of trachea/pharynx suctioning:

- Hypoxia
- Injury of the tissues, trauma, bleeding
- Aspiration
- Laryngospasm
- Bronchospasm
- Apnea
- Atelectasis
- PTX
- Interruption of artificial ventilation
- Infection
- Vomiting
- Increased vagal tone
- Arrhythmia
- Fluctuating blood pressure
- Increased intracranial pressure
- Pain
- Catheter malposition
- Anxiety, discomfort

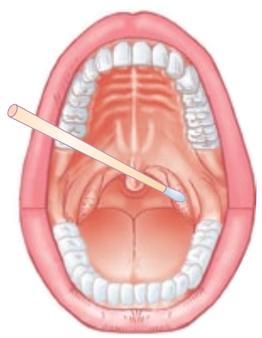


Pictures 7. ábra a, b. Suction catheters

Respiratory specimen collection

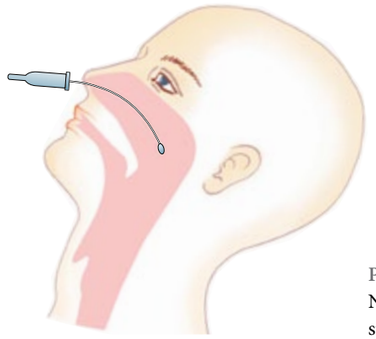
Microbiological investigation of the respiratory secretion may also be necessary. Specimen can be collected from the upper or lower respiratory tract with invasive or non-invasive methods.

- Throat secretions: to indicate the presence of various strains or infections (e.g. MRSA, tonsillitis) – push down the tongue with a spatula, then rub the swab against the throat or the tonsils without touching the mucosa of the mouth.
- Nasopharyngeal specimen collection: specimen is collected with a nasopharyngeal tampon it is inserted to the posterior nasopharynx (specimen is certainly collected from the appropriate area if the patient is sneezing or coughing)
- Sputum specimen collection: try to collect specimen from the deeper respiratory tracts instead of collecting saliva; it is rather used in case of adults (for detecting



Picture 8. Throat secretion specimen collection

pneumonia, bronchitis). If possible early morning specimen is preferred; the patient should rinse the mouth thoroughly with water, then after a deep cough spit in a sterile and lockable specimen collection container. The specimen can be stored at room temperature only for a few hours.



Picture 9. Nasopharyngeal specimen collection

- Tracheal secretion: this is viable in the case of intubated, ventilated patients from the deepest point possible with a sterile suction catheter. The secretion remaining in the lumen of the suction can be transferred into a test tube with a little physiological saline. It is considered equivalent to sputum collection.

Picture 10. Specimen container attached to a suction catheter

Ventilation

So far techniques and methods for improving oxygenation have been discussed in this chapter. In the following the treatment of those conditions will be discussed in which it is not sufficient to apply techniques improving ventilation, but it is necessary to assist or replace spontaneous breathing. In the former case we can talk about assisted, in the latter case about controlled mechanical ventilation.

In case of the application of mechanical ventilation and when choosing the appropriate mode/method to provide ventilation it must be taken into account that the method should approximate the physiological respiration as much as possible and it needs to be sufficient for the treatment of the condition which indicates it. Ventilation methods also can be categorised by the necessary interventions – invasive and non-invasive ventilation can be distinguished.

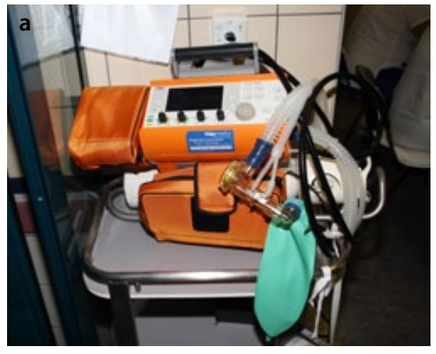
Complications of mechanical ventilation

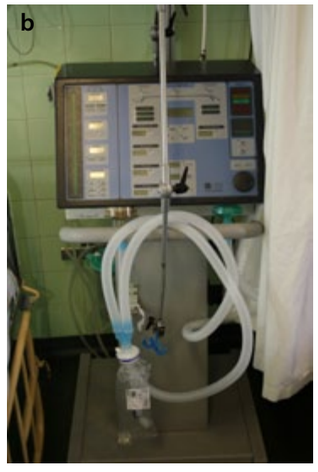
1. Complications of the respiratory tract

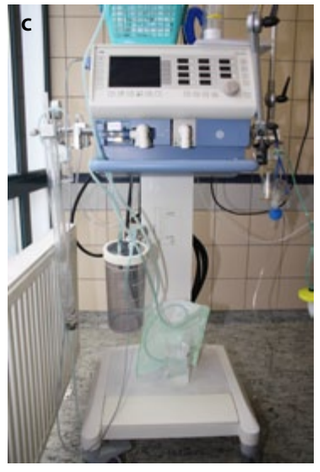
- Complications of airway management:
  – complications of the autonomic nervous system
  – consequences of hypoxia
  – risk of aspiration
- Complications of the respiratory tract during mechanical ventilation
  – Dislodgement of the endotracheal tube
  – Occlusion or narrowing of the endotracheal tube
  – Injuries
- Complications during extubation:

2. Intra-thoracic complications

- Pneumothorax (PTX)
- Ventilator-associated pneumonia
- Ventilator-associated injuries of the airways







Pictures 11. a, b, c. Mobile respirator and various mechanical ventilators

Nursing care of the ventilated patient – special aspects

In spite of the fact that mechanical ventilation releases the patient of respiratory effort, it is a shocking and psychologically burdening process. Endotracheal intubation deprives the patient of communication and constrains mobility and, restricts the satisfaction of physiological needs.

Ideally (although less frequently) there is enough time before mechanical ventilation and prior to endotracheal intubation to inform patients and to prepare them for the restrictions it will bring and assure them of our support, thus achieving co-operation and reducing anxiety. However, even if time is limited the former must be realised, at least partially. The ventilated patient is unable to speak but may be able to write. Erasable writing boards and notebooks can provide help in this. Recently mobile computers (tablet PC, laptop) are also applied in order to contribute to communication.

Warming and humidifying the inhaled air

During mechanical ventilation the warming and humidification of respiratory gas is imperative since the gas (mixture) delivered through an artificial airway evades the nasopharynx, so it is not humidified and warmed physiologically.

If it is not performed:

- Cilia suffer damage that hampers the discharge of secretion, thus it leads to the accumulation of secretion
- The humidity of the mucous discharge decreases, so the airways can be clogged due to thick secretion
- Lung compliance decreases due to cell shrinkage, thus respiratory work increases
- Mucosal ulceration develops that increases airway resistance
- Surfactant loss, resultant atelectasis
- Due to heat loss hypothermia can develop.

Patient safety

The vital parameters of the ventilated patient are already unstable due to underlying diseases, not to mention the risk of complications related to mechanical ventilation. This fact reflects to the need of constant monitoring. Each monitor signal has to be noticed immediately, together with performing the appropriate interventions without any delay. That is why international practice expects a 1 to 1 patient-nurse rate in case of ventilated patients. Required parameters are summarised in the following chart:

Nursing care duties:

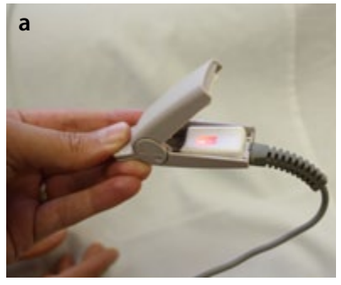
- Take care of the patient's communicative needs
- Check the position of the endotracheal tube
- Monitor the parameters of oxygenation
- Apply thoracic physiotherapy
- Perform mouth care every 2-4 hours
- Make sure that the patient is allowed to rest
- Position the patient so as to ensure ideal ventilation/perfusion ratio
- Check body fluid regulation and nourishment level, and correct if necessary

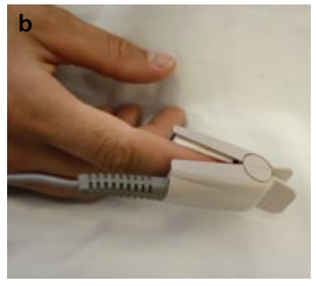
Pulse oximeter

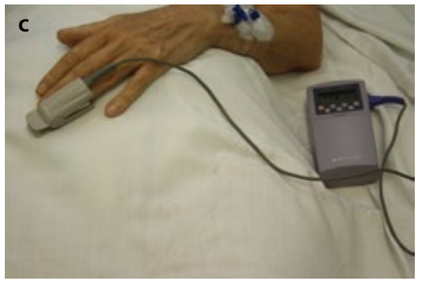
The signs of hypoxaemia can be visible to the naked eye on physical examination. However, appropriate care requires more reliable methods since the diagnosis of peripheral cyanosis is subjective and can depend on several factors (e.g. the experience and eyesight of the examiner, optical conditions, and the pigmentation of the patient's skin). Pulse oximetry is a non-invasive, easy-to-use and accurate device for measuring oxygenation.

The haemoglobin oxygen saturation in arterial blood (oxygen saturation; SpO2) can be determined with the use of pulse oximeters. The device also measures cardiac frequency and is able to monitor pulse wave (pulse pressure, pulse wave amplitude) and systolic blood pressure. This frequently used device can be applied in several fields during monitoring and oxygen therapy.

Proper placement of the pulse oximeter is extremely important. The photodiode and the photo-detector must face each other, and the light has to pass through tissues. The patient's finger has to be placed in the probe entirely. Primarily fingers of the hand are chosen for placement of the device. In most cases the use of reusable clip sensors is suitable, the use of adherent sensors is indicated whenever continuous application is needed or motion artefact is expectable.







Pictures12. a), b) Pulse oximeter probe
c) Portable pulse oximeter

Pulse oximeter types according to placement:

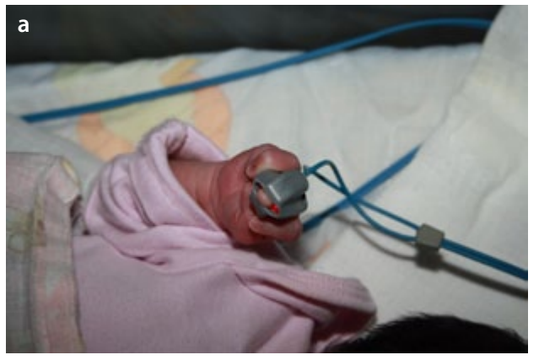
- finger
- ear
- forehead
- nose
- hand/foot
- the body of the penis in case of male infants (Grap 2002)

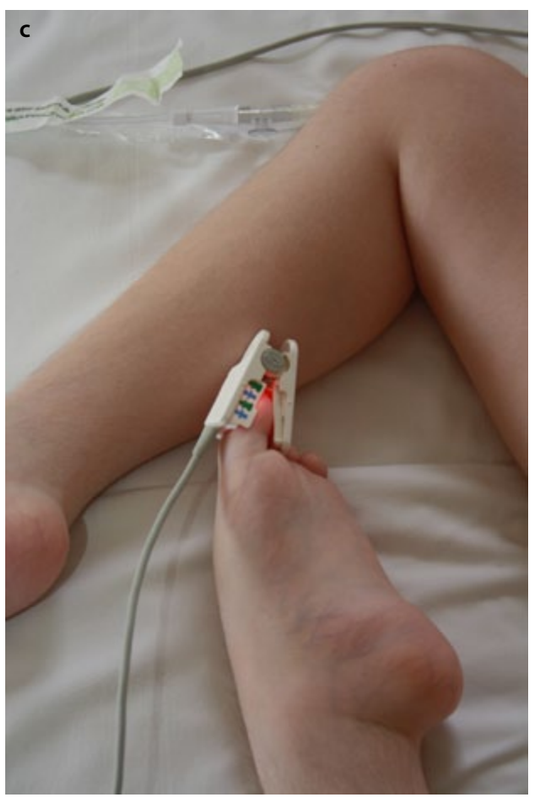
Pulse oximetry can be adversely influenced by several factors such as hypotension, twitching, pulsations, oedema, nail varnish, false nails, abnormal haemoglobin and anaemia.

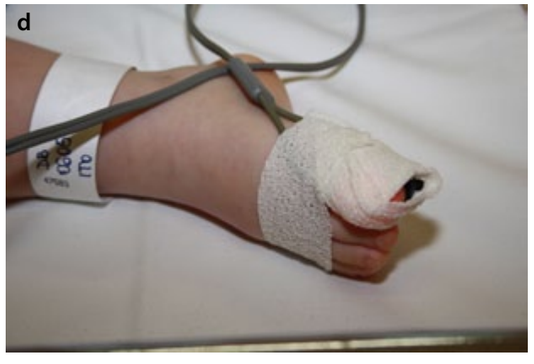
Arterial oxygen saturation is considered normal in the range between 97% and 99%.

Capnography

A capnograph is a device for the continuous measurement of the CO_2 content of expired air. The infra-red spectrophotometer is based on the principle that there is a linear correspondence between light-absorption and light-absorbing substances, that is, the higher the CO_2 concentration, the higher the absorption. Capnography can be used in monitoring ventilation, mechanical ventilation and the position of the endotracheal tube.







Pictures 13. a, b, c, d. Various places for the placement of the pulse oximeter

Inhalation therapy

Inhalation treatment is applied in the treatment of acute and chronic obstructive respiratory diseases; its aim is to enhance expectoration and to achieve local effect. The agent is delivered to the respiratory tracts and the bronchial mucosa in aerosol form. The advantage of this therapy is that due to the form of delivery the concentration of the active agent is high even with less medicine, and the advantage of local application is that the risk of systemic side-effects is reduced. Inhalation itself is influenced by several factors, the size and shape of aerosol particles are crucial, since particles btw. 2,1-4,7 μm are the most effective in the therapy. It is important to note that inhalation therapy is always to be administered orally, because nasal respiration cannot result in an adequate concentration in the lower respiratory tracts. From the patient's side the technique and duration of inspiration are significant which can differ with various inhalators, thus it is the duty of the nurse to inform the patient on the proper inhalation manoeuvre.

Advantages and disadvantages of inhalation therapy

The advantage of inhalation treatment is that the active agent is delivered directly to the lungs so even a small dose is enough to achieve desirable effect. Treatment is simple so the patient and/or relatives are able to acquire the necessary knowledge and experience. Disadvantages include that it demands equipment and requires passive or active co-operation from the patient; in case of children the family needs to contribute actively and dosing may be uncertain since the obstruction of the airways brings up the question of how much of the administered medicine reaches the lungs.

Main inhaler types

- gas-propelled, metered-dose aerosol inhalers
- dry powder inhalers
- nebulisers

Metered-dose inhaler (MDI) aerosols

These are small, cheap and widespread devices. The vaporised drug is delivered directly into the bronchi, so its effect is rapid with a small amount of medicine. A metering valve ensures the delivery of the appropriate amount of drug in the airways. Its application requires the patient's active co-operation, since the puffing of the spray and inhalation should be concerted (completely controlled inspiration must be started within 0,2 second after the pressing of the canister).

Application of spacers (attachments)

Spacers (aerochamber, babyhaler, nebuhaler, NES-spacer) allow simpler delivery of the drug into the airways than aerosols. This is because the spray is stored in a canister first, then the desired amount of drug is delivered to the lungs with multiple inspirations and expirations. Spacers can be equipped with a mask or mouthpiece, small- or large-volume, plastic or metal (e.g. NES-spacers). A larger portion of the sprayed medicine precipitates on the inside of plastic reservoirs (due to electrostatic charge) than in case of metal spacers.

Picture 14. Meter-dosed inhaler

Powder inhalers

On application the capsule in the spinhaler is pierced with a pin then the powder containing the drug is delivered to the lungs together with air breathed in through the device and, accumulated in the lungs, it functions preventively. The device is actuated by the patient's breathing, its advantages include small size, it is easy to learn how to apply it, and it does not require the meticulous co-ordination of breathing and dosing as it is the case with the above described aerosols.

Nebulisers

The advantage of nebuliser machines is that they are suitable for mixing various medicines, moreover even oxygen can be administered with the device (e.g. by attaching a face mask). Its application is easy to learn and it even can be used for dissolving mucus without adding any drugs (e.g. with

Picture 15. Babyhaler

physiological or hypertonic saline). The disadvantage of the device is its size which limits mobility during administration. It is long lasting and in case of certain diseases (bronchial asthma, bronchitis, cystic fibrosis, pseudo-croup, etc.) it is available as a subsidised medical device.

Inhalers can transform the medicine into aerosol form in two ways:

- *jet compression:* high-speed compressed air produced by a compressor transforms liquids into an aerosol mist. They have a low nebulisation capacity (0,25-0,4 ml/ minute).
- *ultrasonic:* liquids are nebulised by a high-frequency sound wave; they have a high nebulisation capacity (1 ml/ minute).

Application of MDI aerosol sprays

Demonstrate the parts of the device to the patient, including the canister, the mouthpiece and the protective end cap. Instruct the patient to take deep breaths before applying the device. Tell the patient that before first use the application of the device always has to be controlled. First make the patient remove the protective cap from the mouthpiece. Then ask the patient to check the cleanliness of the device; make sure that the mouthpiece is clean and contains no foreign substances. Shake the inhaler at least 4-5 times, thus enabling it for inhalation. Demonstrate how to hold the device between the thumb and the index finger vertically, placing the thumb under the mouthpiece. Show the patient that the device has to be held during inhalation in a way that it is directed towards the pharynx. The head has to be tilted slightly back. Ask the patient to exhale comfortably, then put the mouthpiece into the mouth, close the lips tight without biting on the device. Instruct the patient to take a slow, deep breath and at the same time press the canister so that the medicine can get into the mouth. Ask the patient to hold his/her breath for 10 seconds and remove the mouthpiece from the mouth. Wait 0,5-1 minute if more than one inhalation is prescribed by the doctor. Ask the patient to place the cap back on the mouthpiece so as to protect it from dust.

Application of discus inhalers (diskhalers)

As a part of patient education, demonstrate the parts of the discus to the patient, which are the following: flap/lid, ridge, dosage display, mouthpiece and cover. Before use, warn the patient not to turn the device upside down after activating it, because the contents may spill. Tell the patient that she/he has to exhale completely before putting the device into the mouth. Do not forget to mention that the patient must not exhale back into the diskhaler! Also mention that the mouth needs to be washed out after each inhalation, but the rinsing liquid must not be swallowed.

After education demonstrate the application of the device. When opening the device, ask the patient to hold the cover of the diskhaler with one hand so that the ridge remains free. Then get the patient to open the tray with the thumb of the other hand. Now the device has to be activated. The patient has to hold the mouthpiece toward himself/herself, then ask him/her to push the flap. The next step is inhalation. Tell the patient that now he/she has to exhale slowly, holding the device further from the body. Then ask the patient to place the device to the mouth and close the lips around the mouthpiece, then inhale air quickly and as deeply as possible through the mouth. The patient should remove the mouthpiece when the procedure is finished, and hold his/her breath for circa 10 seconds, then exhale slowly.

Pictures 16. a, b. Application of MDI aerosol sprays

Table 17. Diskhaler

Finally shut the device with one thumb, pull the flap back towards the body. Instruct the patient to rinse the mouth with water after inhalation.

Turbohaler

As a part of patient education, demonstrate the parts of the turbohaler to the patient, which are the following: cap, dosing display, mouthpiece, dosing mechanism. Before use warn the patient not to touch the mouthpiece with hands. It is unadvised to turn the device upside down after activating it, because the contents may spill easily. Before medication the patient must not exhale through the device since the drug can be adversely affected by moisture. Call the patient's attention to the fact that the device must not be used if it is damaged! If multiple inhalations are prescribed by the doctor, inform the patient that he/she has to repeat the medication procedure in accordance with the instructions. Do not forget to mention that the dosing disk must not be rotated more than once because the device doses a single dosage. Also mention that the mouth needs to be washed out after the procedure, but the rinsing liquid must not be swallowed.

After education demonstrate the application of the device. Firstly, ask the patient to take the device in one hand and unscrew the outer protective cap holding the Turbohaler vertically, so that the dosing mechanism is pointed downwards. Then instruct the patient to twist the dosing disk as far as it goes and then back, since this is how the drug is moved to the reservoir. Tell the patient to exhale slowly before placing the device to the mouth. Then ask the patient to place the device to the mouth and close the lips around the mouthpiece, then inhale air deeply and forcefully through the mouthpiece. The patient should remove the mouthpiece when the procedure is finished, and hold his/her breath for circa 10 seconds. From then on the patient can breathe normally. Replace the cap after the procedure. Instruct the patient to rinse the mouth with water after inhalation.

Application of nebuliser machines

As a part of patient education, demonstrate the parts of the nebuliser to the patient, which are the following: compressor, face mask, mouthpiece, drug reservoir and a transparent plastic tube. Outline the necessary information related to the inhalation solutions used with the device. Tell the patient that certain inhalation solutions, such as Attrovent or Berodual, are to be dosed by drops. These solutions need to be diluted with physiological saline to 3-4 ml, and only than can be placed in the reservoir. Pulmicort suspension is available in 2ml single-dose units that must be shaken before use. Adults are recommended to inhale 1-2 mg daily. Show the

Table 19. Nebuliser

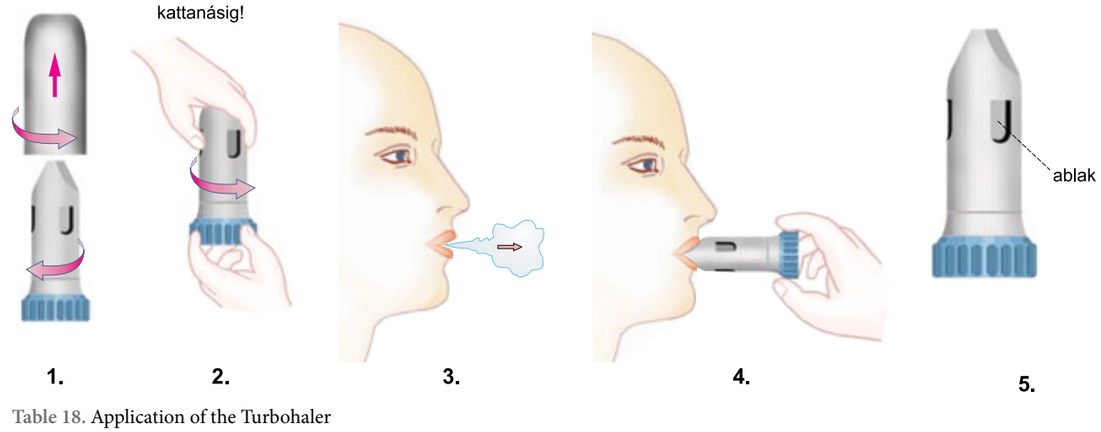


Table 18. Application of the Turbohaler

patient the correct use of the face mask. Call the patient's attention to fasten the mask tightly on the face. If the patient uses a mouthpiece, take care to close the lips tight after putting it into the mouth. Inform the patient that the application of the nebuliser may take 10-20 minutes, depending on the amount of the necessary medication. Outline the cleaning of the device as well. The drug reservoir and the mouthpiece/face mask must be washed after use. Clean water is enough for cleaning the device.

After education demonstrate the application of the device. Firstly, ask the patient to connect the compressor and the reservoir with the plastic tube included in the kit. Then open the reservoir and fill in the solution prescribed by the doctor. Close the reservoir and place the mask on the face or put the mouthpiece into the mouth. In the next step, turn on the device. Instruct the patient to take deep breath continuously until the reservoir is depleted. After inhalation ask the patient to rinse the mouth with water, and if a face mask has been used, to wash the face thoroughly.

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27. Wound Care – Wound Management

by Ph.D. Ágnes Váradyné Horváth, Nikolett Hegedűs, Ágnes Müller, Erika Nagy, Ph.D. Béla Schmidt, Mariann Raskovicsné Csernus

Anatomical and physiological introduction

Properties of the skin

Human skin is our largest sensory organ, its functions include protection against mechanical, chemical and biological impacts; body temperature regulation, secretion, sensation and storing nutrients. Its adult size is the amount of the body height in meter squared; circa 1,6-1,8 m^2. The thickness varies with the different body parts, it is the thinnest on the eyelids, the thickest on the upper part of the back. Its weight makes up 7% of the whole body weight, thus it is the biggest organ of the body. The colour of the skin depends on its pigment content and the amount of blood in the capillaries. Melanoderma (black), xantoderma (yellow) and leucoderma (white) types can be distinguished. In case of pigment deficiency albinism occurs. The patterns of lines (dermatoglyphs) of the skin, which can be found on the palm, the sole and the fingers, and are caused by the dermis bulging into the epidermis, are used as a means of identification in forensic science. The epidermis is constantly renewed from the basal layer (stratum basale), during life about 20–25 kg skin cell is pushed off it.

The structure of the skin

Human skin (cutis) consists of an outmost layer (epidermis), the dermis/corium, and the subcutaneous tissue (subcutis/tela subcutanea/hypodermis). The epidermis contains multiple layers of cornified squamous cells.

Keratinocytes, melanocytes, Langerhans cells and Merkel cells constitute the epidermis. Keratinocytes produce keratin which has a role in the development of the water barrier. Melanocytes are located in the basal layer, their primary function is the production of melanin pigments. Langerhans cells are dispersed throughout the basal and the spinous layers and they have a role in the immunity of the skin. Merkel cells are the modified keratinocytes of the basal layers which are responsible for tactility. The epidermis does not contain any veins, it is nourished from the papillary layer of the dermis by means of diffusion.

The dermis is constituted of connective tissue, and it includes two layers. The upper, papillary layer consists of elastic and collagenous fibres with capillary vessels. Free terminal filaments and Meissner's tactile corpuscles can also be found in this layer. The lower, reticular layer is a compact, fibrous connective tissue, its collagen fibres are arranged into fascicles, and the elastic fibres are thicker than those of the papillary layer. The tensional direction of the collagen fibres determine the cleavage lines of the skin; in case of incisions parallel with these lines recovery is easier.

The subcutis is a spongy connective tissue containing fatty tissue varying individually and with the parts of the body. It contains the larger veins of the skin. Subcutaneous tissue connects the epidermis and the dermis to the organs below them (muscular fascia, bones), and its tasks include insulation, energy preservation and mechanical protection.

Skin appendages

Skin appendages include nails, hairs, skin glands, mammary's and the terminal filaments of the skin.

Nails

Nails are foliated keratinous coverings on the dorsal side of the distal digits. The vascular bed of the nail-bed below causes its pink colouring; by pressing the nail the conditions of blood circulation can be judged based on the quality and speed of change in colour.

Hairs

The threadlike forms of the topmost layer of the skin extending into the subcutaneous layer, and are located in the follicles, that is, the infoldings of the epidermis. At the base of the follicle the hair bulb can be found, at the end of which the papilla is located that contains the veins supplying blood, and the pigment cells determining the colour of the hair(s). The part of the hair extending above skin surface is the shaft. In case of white hair pigments cells are replaced with oxygen. The ejector opening of the sebaceous gland also opens into the follicle, this produces the oil protecting the skin.

Skin glands:

sebaceous glands, eccrine glands and apocrine glands.

Mammary

The mammary is a modified apocrine gland which develops in both sexes. Their further development and enlargement starts with puberty in women, in men it remains rudimentary.

The nerve-terminations of the skin

Skin is provided with sensitive fibres by the trigeminal nerve on the head and the face, and by the spinal nerves in other areas of the body. Nerve terminations have auctorial names, and they can be bare or enveloped in endoneurium. Merkel cells, Meissner's cells and Vater-Pacini corpuscles are able to sense tactile (touching, pressure) stimuli; Ruffini's and Krause's corpuscles sense heat, nerve-ending terminals sense pain.

Functions of the skin:

- protection against mechanical, sunlight, chemical and biological impacts
- sensation
- temperature regulation
- absorption (also operates as a medicine barrier)
- nutrient storage
- secretion
- vitamin synthesis (Bevan 2005)

Wounds; types of wounds

Wounds are breaks in the skin caused by any kind of external impact; an injury that can occur on any organ or tissue.

Types of wounds can be classified on the following bases:

- the mechanism of the injury (from an aetiological perspective),
- the grade of infection,
- depth and
- the time elapsed from the infliction (trauma).

Aetiology, incised or cut wounds, contused, lacerated, punctured, gunshot and bitten wounds can be distinguished.

- *Incised or cut wounds (vulnus scissum et caesum):* inflicted by sharp objects (even surgical incision). In case of incised wounds the direction of the force is tangent to surface, while in case of cut wounds it is perpendicular. Wound edges are clean and straight, but significant bleeding may occur.
- *Contused wounds (vulnus contusum):* closed or open wounds inflicted by blunt force trauma. Wound edges are irregular and torn.
- *Lacerated wounds (vulnus lacerum)* are inflicted by great blunt, tearing or shearing forces, the result of which may be a need for amputation.
- *Punctured wounds (vulnus punctum):* a relatively small, seemingly minor injury of the tissue inflicted by pointed instruments (e.g. needle, knife). It involves a risk of anaerobic infection and of the injury of major veins and nerves.
- *Gunshot wounds (vulnus sclopetarium):* at the entry site and possibly at the exit site of the projectile an opening can be found. Foreign bodies also may remain in the wound, and the organs affected by the tunnel of the bullet may suffer various injuries, therefore the risk of infection is extremely high.
- *Bite wounds (vulnus morsum)* also involve a high risk of infection, either they are caused by animal or human bite. The wound has the characteristics of lacerated and torn wounds.

Based on ***the grade of infection,*** wound types can be classified as clean, clean-contaminated, contaminated and dirty or infected. (Julia S. G. 1985)

- In case of *clean* wounds only normally present bacteria of the skin are present. Surgical wounds are the most common ones in this type, the edges of which are stitched together, and no inflammatory processes can be perceived. The risk of infection is 1–5%.
- *Clean-contaminated wounds* are surgical wounds inflicted under controlled circumstances of surgical operation (respiratory, alimentary, gynaecological and urological operations). The risk of infection is 3–11%.
- *Contaminated wounds* can be inflicted by open injuries and surgical operations when incision is made in acute, non-purulent, inflammatory processes (e.g. operation of the gastrointestinal tract). The risk of infection is 10–17%.
- In case of *dirty or infected wounds* older accidental wounds, mortified tissues, clinical infections or perforations of organs cause post-surgical infections, the risk of which is over 27%.

The grades of surgical infection are the following:

- contamination: the presence of non-replicating bacteria on the wound surface
- colonisation: non-replicating bacteria are attached to the tissue around the wound, which do not cause any harm to the host (Voulo 2006)

These former stages mean a balance between the host and the bacteria. If this balance is dissolved, the following can occur:

- critical colonisation: bacteria in the tissue around the wound cause difficulties in the recovery
- infection: bacteria replication in the wound; the presence of serious septic symptoms affecting the whole organism or the limb.

Assessing the grade of infection is contributed by the classic and secondary symptoms of inflammation (swelling, flushed skin, hotness, changes in defluxion, occasionally pain and functional deficiency):

Based on the *depth* of the wound:

- Grade 1 superficial wounds affecting only the epidermis and the dermis (e.g. abrasions)
- Grade 2 partially full thickness wounds extending to the lower border of the dermis
- Grade 3 full thickness, injuries of the skin and the subcutaneous connective tissue
- Grade 4 deep wounds, complex injuries (injuries of the veins, nerves, possibly of the skeletal system), wounds opening cavities and wounds penetrating into internal organs.

According to the time elapsed from the infliction of the wound, acute and chronic wounds are known.

Acute wounds are caused by mechanical and other injuries.

In case of chronic wounds more time (over 6 weeks) is necessary for the recovery of the anatomical and physiological integrity of the skin. Among others, these include aetiologically different foot ulcers, pressure ulcers, malignant wounds (when healing is delayed), and diabetic foot ulcers.

Directives for the management of acute wounds: COMPLEX care, the elements of which are the following:

- lying the patient down
- lifting the injured limb
- control bleeding
- cleaning; washing the surrounding areas with water
- antiseptics (direction: outward from wound edges!): e.g. Betadine, which also can be used in the wound itself
- sterile dressing and fastening
- pain relieving
- resting position (rescue, comfortable position, elevating necessary body parts, fixing original position)
- cooling (if necessary)
- pharmaceutical pain relieving
- psychical support (encouraging coping mechanism)
- protection of the caregiver (HIV, HBV etc.)!
- Avoid getting talcum powder, cream, ointment, oil into the wound!
- Foreign bodies must not be removed from the wound!

Wound treatment

Consequentially to an injury blood loss (blood plasma and blood cells) and the dysfunction of the protective role of the skin may occur, thus pathogens may enter the organism. During wound healing the injured tissues are recovered by complicated bio-chemical and cellular physiological processes. The full recovery of the wound is a series of complex events starting at the moment of the injury, and it can last for months or even for years. The different healing processes are not clearly distinguishable with time, they may occur simultaneously.

Primary wound healing is normally a 3-10-day process without complications, during which the integrity of the skin is nearly fully recovered.

Tissue integration processes, suture removal

As a closure of surgical interventions the integration of the tissues is performed. Basic tissue integration processes:

- suture
- clip
- other (tissue glue, self-adhesive bands)

1. Stitching (suture)

Different stitching types are applicable depending on the number of layers, tissue depth and longitudinal order. (Al-Ghamdi, 2008, Hussain et al., 2009)

From the perspective of nursing practice the simple interrupted stitching of the skin or subcutaneous layer, the running intracutaneous suture, and vertical mattress skin stitches are emphasised here.

Simple interrupted suture (sutura nodosa): a frequent type of suture of the skin, fascia, and muscles. Each stitching is followed by a knot, thus it has the advantage that even if one stitch loosens, the others provide sufficient hold.

Running intracutaneous suture runs along in the dermis. The thread is above the surface on the skin only at the beginning and at the end, where it is knotted or fastened to the skin with glue. Scar-tissue formation is good.

Donati suture (vertical mattress stitching): The double-line stitching named after Milanese surgeon Mario Donati (1879–1946) is a deep stitching through the skin and the subcutaneous layer, with a shallow backstitch placed superficially in the upper dermis. So the two stitches are at right angles to the wound and parallel to each other.

Methods of Wound Closure:

Sutures

Primary suture means immediate wound closure less than 12 hours from the time of the injury, with no local inflammatory symptoms present.

Primary delayed suture, when tissue reintegration is performed 3-8 days after initial open wound care.

Early secondary suture follows open wound care after 2 weeks from the injury.

Late secondary suture is applied in the 4-6th week after open wound care.

In case of multi-layer tissue integration the following perspectives need to be concerned:

- Entry and exit stitches need to be placed 0,5-1cm from the wound edges.
- Stitches have to be placed in equal distances from each other (1-1,5cm).
- Knots have to be located not above the wound edges but to the side from the wound line.
- Stitches have to be made without creases and gaps.
- Wound edges must face each other.

- In case of superficial wounds stitches reach the base of the wound.
- Do not pull the thread forcefully.
- The closure of deep wounds is multi-layered.
- In case of skin stitching stitches are wider, since more than one tissue needs to be stitched together.

Clips

Tissue integration can also be performed with alloy steel or titanium alloy clips. It is suitable for the closure of cutaneous wounds, gastro-intestinal sutures, lumenal parts (veins, cavities), and this method is also applicable e.g. in video-endoscopic surgery.

Skin clips can be applied in areas where tissues are not under tension, and the scar healing of the area is adequate, e.g. after appendectomy, strumectomy or herniotomy. Clips or clamps can be applied either by manual surgical staples or by modern devices suitable for the application of skin clips as well.

Other tissue integrating techniques

Tissue glues can be used for fastening skin transplants, haemostasis, anastomosis, and securing vein and nerve sutures

Tissue integration can be performed by means of *self-adhesive bands* (Steri-Strip) if the wound edges can be united adequately, or in the case of smaller wounds where suturing is not necessary.

Removal of stitches and clips

The time of removal depends on the place of the suture or clip, the vascular bed of the surgical area and the general condition of the patient. Stitch removal takes place within 3-14 days. The protocol is attached in Attachment 1.

Steps of removal of simple interrupted sutures:

- Apply antiseptic on the skin.
- Grasp the thread above the knot with anatomical tweezers, and gently lift.
- Cut the thread above the surface of the skin with scissors or surgical knife.
- Pull the thread out of the skin without pulling the superficial part through the wound, since it might lead to infection.
- Remove sutures one after the other.
- Observe the wound.
- In case of any irregularity (e.g. separation of wound edges, defluxion, bleeding) consult a doctor.
- Apply dressing.
- Documentation

Removal of running intracutaneous sutures:

- Apply antiseptic on the skin.
- Grasp one end of the thread with anatomical tweezers, cut above the surface of the skin with scissors, then let it go.
- Grasp the other end of the line and pull it out toward the direction of the wound.
- Observe the wound.
- In case of any irregularity (e.g. separation of wound edges, defluxion, bleeding) consult a doctor.
- Apply dressing.
- Documentation

Removal of clips with Michel Suture Clip Applicator & Remover *(Picture 1)*

- Apply antiseptic on the skin.
- Grasp the ring at the bottom of the clip with tenaculum.
- Slide the edge of the remover between the wound line and the clip, in the curve of the clip, then close the remover, thus the clip opens and its clamps slip out of the skin.
- Remove clips one after the other.
- Observe the wound.
- In case of any irregularity (e.g. separation of wound edges, defluxion, bleeding) consult a doctor.
- Apply dressing.
- Documentation

Drainage

The risk of wound infection can be reduced by letting the discharge (e.g. blood, purulence, dead cells, other body-fluids) accumulated in the wound cavity out of the body, since they may serve as a culture medium for the reproduction of microorganisms. *(Picture 2 a, b)*

Main types:

Passive drainage is applied without active suction. Discharge is let out by tampons, strips, tubes, rubber glove fingers (Penrose-drain) placed in the cavity. These devices tend to slip out of the wound, therefore they can be fastened on the surface if possible.

In case of *active drainage* the removal of the discharge (exudate) accumulated in the wound cavity takes place by negative pressure (suction); by means of less (Polyvac) or more forceful (Redon) vacuum suction.

Consequently, concerning drainage we can distinguish the usage of (the above mentioned) *suction drain,* besides *irrigation (rinse) drainage* can also be applied. It can be mentioned as a special drainage type; the *postoperative blood salvage* (PBS) takes place in a *closed system, at low vacuum* (70–100 mmHg). Anti-coagulation is not essential for this technique since the collected blood is defibrinated, it contains fibrinogen disintegration products and coagulation factors. However, anti-coagulants also can be added if necessary. The discharged blood is filtered through a microfilter (btw. 10–200 µm). The 10-µm filter holds back fats, microaggregates, cell debris.

Picture 1. A kapocsszedés eszközei

Postoperative blood salvage is *applicable* in orthopaedic surgery after knee or hip arthroplasty, and after thoracic and vascular surgical operations.

Contraindications include infection around the surgical area, malignant tumour, coagulopathies, sickle cell anaemia, heart failure (NYHA II), kidney failure, hepatic cirrhosis (cirrhosis hepatis) and those medication applied around the surgical area which cannot be applied intravenously.

- Advantages include that less bloody discharge remains in the wound, the risks of secondary bleeding and haemolysis are lower. In case of PBS drain removal is accompanied by less pain than in case of traditional drainage. It is easy to use and latex-free.
- Its disadvantage is that if the filter does not function adequately, there is a possibility of bacterial contamination.

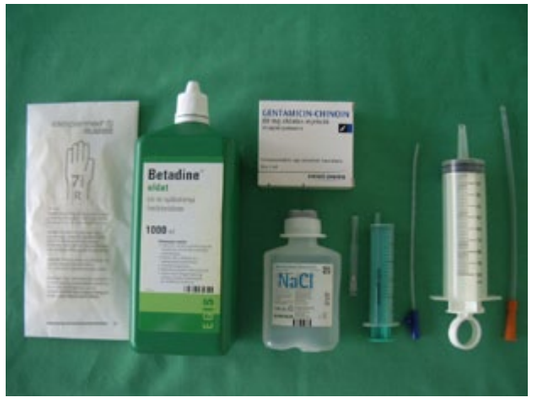
When applying drainage the integrity of the skin is broken in order to let out the discharge, however, it is a risk factor for pathogens to enter the wound. Therefore it is important to follow the rules of asepsis- antisepsis, to monitor the closed drain-system, and besides observing the discharge, to observe the skin around the drain as well.

Treatment of the skin around the drain:

- removal of soiled dressing
- application of antiseptics on the skin
- tending the skin with nourishing, water repellent creams (e.g. zinc-oxide cream) to prevent irritation.
- application of sterile dressing
- fastening dressing
- checking the closed system (if suction works or not)
- patient education
- documentation

Characteristics of the reaction-free wound:

- the post-operative wound shows the characteristics of the stage corresponding to the days elapsed from the time of the operation (e.g. second day after surgical operation: inflammation)
- the wound and the surrounding area is free from the symptoms of inflammation (signs of inflammation: dolour, tumour, calor, rubor, functio laesa or pain, swelling, heat, redness and loss of function)
- conditions of undisturbed wound healing: clean wound, adequate macrophage function, oxygen supply
- signs referring to the disturbance of wound healing: inflammatory symptoms, increased defluxion, pain, fever, bleeding, wound separation and other disorders in recovery (e.g. seroma, haematoma, cheloid, hypertrophic scars).



Picture 2. A dréngondozás eszközei

In case of *secondary wound* healing the wound fills up with connective tissue evolving into a scar, which often undergoes superinfection; its recovery takes a long time (Picture 3). A wound which does not heal within 8 weeks and has a prolonged period of healing should be defined as a chronic wound.

- Granulation starts from the wound base
- Scar tissue produces exudates due to the inflammation
- The wound cavity is filled up with the scar tissue which is rich in hyaline, thus the wound becomes rougher, more inflexible
- The cuticle is thin and endures less mechanic stress
- Adjunctive parts such as hair follicles, sebaceous, eccrine and apocrine glands do not regenerate

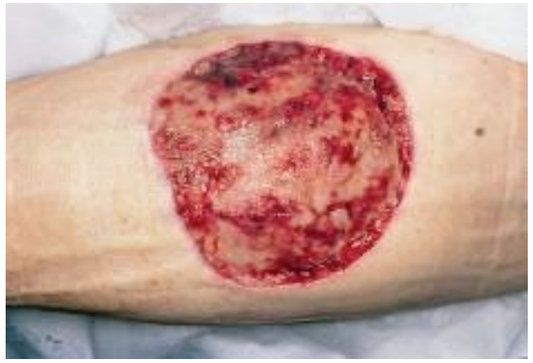
Types of secondarily healing wounds:

- Ulcers resulting from circulatory disturbance e.g. venous: ulcus cruris venosum; arterial: ulcus cruris arteriosum; mixed: ulcus cruris mixtum.
- Pressure ulcer: decubitus
- Ulcers resulting from neuropathy.
- Ulcerous malignant tumours e.g. skin metastases, ulcers resulting from haematological diseases.
- Ulcers resulting from internal diseases e.g. diabetes mellitus (angiopathy, neuropathy); hypertonia (Martonelli ulcer); arthritis urica (ulcerous gouty deposits); vasculitides.
- Infections: pyodermas, infected surgical wounds.
- Burn injuries, traumatic ulcers.

Normal wound healing process alters during chronic and prolonged wound healing. Circulatory lesion causes tissue hypoxia which can be increased further by metabolic disorders and nutrient deficiency. Leukocytes are activated, and due to the dysfunction in the permeability of the capillaries leukocytes leave blood circulation and fibrin is formed, which compromises the ischaemia further and leads to the accumulation of discharge, or may lead to necrosis.

During *wound* treatment the nursing goal is to eliminate the harmful factors affecting wound healing, and to create physiological conditions that can optimise the process of wound healing. Basic principles:

- Assessing the parameters of the wound – extension, depth, pain, defluxion, consistence – and concerning the former; selecting the dressing type(s) suitable for the treatment
- Assessing the general condition of the patient, considering secondary diseases
- Applying the principles of asepsis-antisepsis during nursing practice, and educating the patient of these
- Mechanical protection of the wound area, including the adequate positioning of the patient
- Constant infection control
- Ongoing pain-relieving, involving the patient



Picture 3. Másodlagos sebgyógyulás

Chronic wounds and their care

In wound care the principles of acute wound care need to be observed:

- Wound pain relieve (NSAIDs are usually sufficient)
- Haemostasis (dressing, coagulation, drainage, pressure dressing)
- Protection against dehydration
- Prevention and management of wound infection (deep, necrotic, poorly ventilated wounds with inadequate vascular bed and contaminated surroundings are prone to infection)
- Preparing wound healing (Vosschulte 1982)

The most important task at the exudative or inflammatory stage is to remove dead or ischaemic tissue and to clean up the wound base. Necrosis often can be present on the surface of chronic wounds, consisting of ischaemic tissue, clotted blood, wound discharge and bacteria, and which needs to be removed so that the granulation process can start.

Dead, dysfunctional tissues possess the following harmful impacts:

- they increase the risk of infections,
- encumber metabolism,
- exudation causes nutrient loss,
- they cause psychological stress,
- they hamper the regeneration of cell functions,
- they lead to abscess formation,
- they induce unpleasant smells (odour)
- they make it impossible to assess the whole depth of the wound,
- they have sub-optimal clinical and cosmetic results,
- they delay wound healing. (Benbow 2008)

Via autolysis, the body has a natural defence against harmful impacts of dead tissues by neutrophilic, macrophage and enzymatic phagocytosis, and also by providing a moist environment.

In order to define the condition of the wound by subjective observation the so-called RYB-scheme (Red-Yellow-Black) can be applied, according to which red, yellow and black wounds can be distinguished between. For this purpose continuous monitoring of the wound can be performed both by doctor and nurse. (Vemeulen et al 2007)

Removal of dead tissues is called** debridement**. According to the TIME framework it includes:

T (tissue) – removal of dead tissue,
I (infection) – evasion of infection and critical colonisation,
M (moisture) – ensuring moist environment,
E (edge) – treatment and protection of wound edges. (Schultz et al 2005)

The following *debridement* options are available in chronic wound treatment:

- autolytic debridement,
- enzymatic debridement,
- mechanical debridement,
- surgical debridement,
- maggot debridement therapy,
- chemical debridement.

Autolytic debridement is a low-pain method that means the application of occlusive dressing conducive to the natural autolysis processes of the body. These dressings (e.g. hydrocolloids) provide moisture for the wound, they are impassable by bacteria and contribute to the demarcation of intact and mortified tissues. (Benbow 2008)

Enzymatic debridement cleanses with the help of biochemical mechanisms. It means the application of ointments and solutions which contribute to the demarcation of mortified tissues – among others – with collagen, fibrinolysin, desoxyribonuclease, streptokinase, papain and trypsin enzymes. This procedure involves minimal pain, too. (Lei Shi et al. 2009)

Mechanical debridement includes the following procedures:

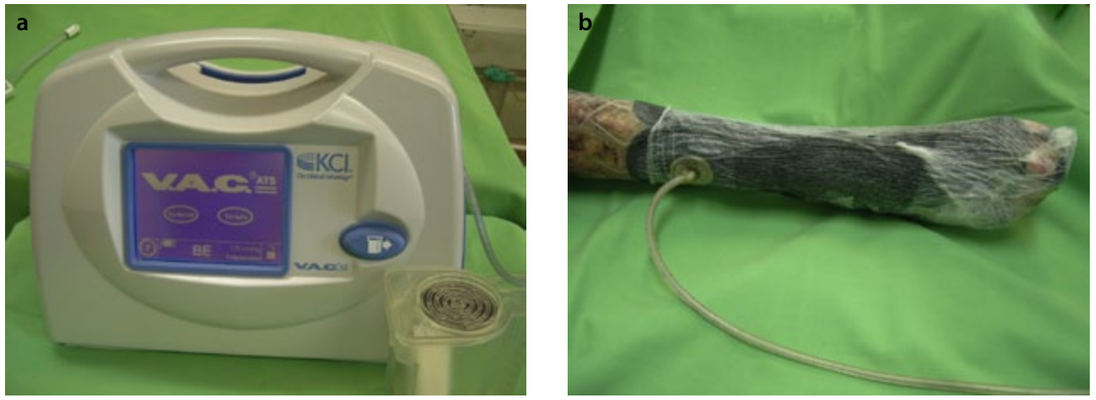
- *Physical wound cleaning:* it means local washing, wound toilette, application of antiseptics.
- In case of wounds covered with necrotic coating *hydrosurgical therapy* is gaining currency. It is a high pressure liquid jet treatment based on the so-called Venturi effect (the liquid jet is accelerated in the constricted area, while significant decrease in pressure and partial vacuum emerges.) This method means delicate cleansing without any collateral damage to tissues. Compared to traditional debridement, Versajet hydrosurgical treatment reduces the time of wound care and the number of necessary treatments. (Caputo 2008)
- The method also includes V.A.C. (vacuum-assisted closure). Treatment by negative pressure on the surface of the wound was first described by Morkwas and Argenta in 1997. *Negative pressure* is applied recently to hasten superficial scar tissue granulation, since this method also enhances increased capillary circulation. Furthermore, the mechanical effect of the vacuum attracts and pulls the wound edges toward the centre, thus reducing the extension of the wound. Wound discharge is directed into a (ml-calibrated) discharge-meter container in the device. (Stevens 2009) *(Picture 4 a, b)*

In the treatment of chronic wounds *ESWT (extracorporeal shock wave therapy)* also can be applied, it has been used since the 1980s. It enhances the disengagement of growth factors, the production of various cytokines and the disintegration of biofilms. Thus neoangiogenesis, reduction of inflammatory complaints and antiseptic effects can be achieved by ESWT therapy. Exact definition of the size and the selection of the adequate energy level for the ulcer base are crucial points.

The beneficial effects of *polarised light* were discovered by a group of Hungarian doctors and physicists in 1981, during a study of lasers. They proved that polarised light stimulates the defence and regeneration mechanisms of living organisms. The energetic activity of cell membranes increase, regenerative processes are enhanced, adenosine triphosphate production becomes faster. The time of wound healing is reduced by one third – one half. Most probably macrophages play the most crucial role in wound healing, since polarised light enhances their growth factor production. The light contributes to the blood circulation of the concerned area, and it reduces pain by eliminating mediators on the molecular level.

Surgical debridement (necrectomy): by surgically removing dead tissues and refreshment of the wound base chronic wounds are transformed into acute ones, which promotes more effective recovery. During the procedure pain relieving, anaesthesiology may be necessary due to the increase in pain. When removing dead tissue from wound edges, the following are required from the nurse: adequate knowledge of anatomy, being able to distinguish between intact and necrotic tissues, ensuring adequate conditions for wound treatment (asepsis-antisepsis), informing the patient of the procedure and essentials of the method, being able to recognise complications (e.g. bleeding), and constant monitoring of the general condition of the patient after the intervention. (Vowden 2002)

Maggot therapy (also known as maggot debridement therapy, larval therapy, biodebridement or biosurgery) is a type of biosurgery during which living, sterilised fly larvae (Lucilia sericata, Lucilia cuprina) are intentionally placed on the non-healing skin area or soft tissue of a human or animal. The pur-



Picture 4. a, b. Vákuumasszisztált sebzárás

pose is removing exclusively the necrotic tissues, disinfection and contributing to healing. The reduction in the amount of pathogenic organisms, a reduction of wound odour, the canalisation of the wound bed and the sufficient rate of wound healing were recognised by Baer. The maggots execute two things:

- Debridement of the wound by removing necrotic, infected tissues. The wound is disinfected by the elimination of bacteria.
- Promoting wound healing by mechanical stimuli caused by the movement of the maggots, which amplifies growth factor production (Paul et al 2009).

According to latest research maggot secretions are able to stimulate human fibroplast production and the growth of slowly growing chondrocytes. Replication of chondrocytes, as well as the formation of chondroid-specific collagen type II, increases. The larval micromassage contributes to tissue granulation. The maggots are placed into the wound floor in a permeable bag-like dressing which can be left on the wound for 2-4 days.

In case of diabetic foot ulcers maggot therapy, early debridement, elimination of infections and managing pain are considered to be of of high importance.

Chemical debridement (e.g. hypochlorite solution) is not in use any more, because these may damage intact tissues as well. (Leaper 2002)

In case of over-exudation the aim is to restrain inflammatory capillary oozing. Following combined debridement, high absorption capacity dressings need to be relied upon, such as:

- Activated carbon dressings: Actisorb plus, Carboflex
- Absorbent hydropolimer dressings: Allevyn, Ligasano, Cutinova
- Absorbent pads: Filmulin, Mesorb.

Frequently occurring bacterial superinfection enhances exudation; leucocytes join the wound discharge. In treating chronic wounds, the monitoring of wound discharge is a significant task for the nurse.

Collecting discharge sample from the wound

Before sample collection it is the task of the nurse to inform and prepare the patient for the sample collection, to identify the patient and the sample, and to transfer the sample to the test site. All exudate has to be treated as an infectious substance, and care has to be taken so that the collector will not touch the sample directly during collection. Sterile sampling tools are necessary for sample collection order to avoid contamination of the specimens. Documentation belongs to the doctor's tasks.

In case of collecting wound exudate specimen, it is a basic principle not to use a dry tampon to collect discharge from the surface of dry wounds! Sterile, physiological saline can be used for moisturising. In case of extended wounds samples need to be collected from several areas, including the edges of ulcers. It is not enough to soak up the pus in a cotton tampon, since it might be sterile. Wound discharge can be sent to laboratory with the purpose of culturing aerobic or anaerobic bacteria and fungi. In case of open wounds necrotic tissues have to be removed after disinfection of the skin, then – following the sample collection – they have to be placed in transport medium. In case of closed or deep wounds the exudates can be retrieved by needle aspiration or surgical exposure.

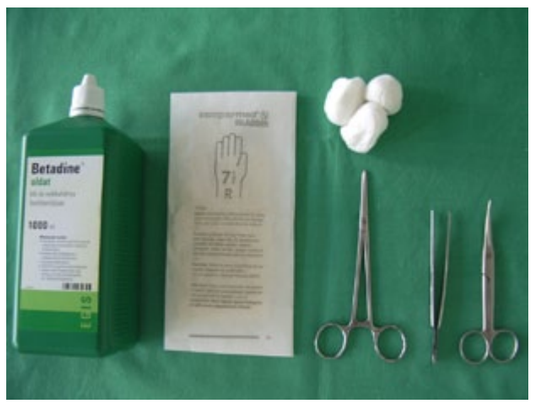
Sample collecting tool: cotton-wool swab with plastic handle and transport medium (blue cap swab, transport medium). *(Picture 5)*

Besides managing discharge, creating an aseptic surface also has a great significance. Povidon iodine (Betadine), silver dressings, alginate dressings and high capacity odour control carbon dressings can be used for disinfection. *Mercurochrome solution is contraindicated due to its toxic impact on tissues and low-efficiency antimicrobic effect!* According to research the frequently used hydrogen peroxide does not effect wound healing negatively, but it is ineffective in reducing the number of bacteria.

At the granulation stage hydrogels, hydrocolloids, hydro polymers and hyaluronates are equally efficient because of maintaining a moist wound environment and their capacity for effective absorption.

At this stage rebuilding tissues have significantly high metabolic needs, and microcirculation only is ensured by a moist environment. Dry dressings were used for wound treatment for a long time, which absorbed discharge from the wound, however, they dried out the wound thus decreasing blood circulation, and they also stuck to the wound, which caused pain on removal, and also damaged newly formed cells. Today it is considered essential to maintain a moist wound environment, so the use of dry dressings should be avoided.

In moist wound healing the wound is closed with dressings that prevent it drying out, thus contributing to angiogenesis and supporting the activity of fibroblast cells. Closing also serves as protection against superficial infection. Several surveys have been carried out in Hungary involving the cost effectiveness analysis of wound treatment methods, and it has been observed that it is not more costly than the usage of traditional dressings, and it shortens the time of hospitalised inpatient care, since less frequent change of dressing (modern dressings can be kept on the wound even up to a week) allow ambulant care. (Ohura et al. 2004)



Picture 5. Sebváladék-mintavétel

Foot and leg ulcers

A painful skin defect extending to partial or full thickness around the ankle, and in case of these symptoms there is no possibility for spontaneous healing. Treatment directives for leg ulcers have only appeared recently within the medical literature.

Ulcus cruris is not a diagnosis but a symptom. It can be defined as a secondary deformation since a wide range of causes can be found. It is often identified with venous origin, which is an incredibly simplified approach, since it is proper for 85-90% of the cases, but arterial causes and neurotrophic disorders also may be responsible for developing foot ulcers. Inaccurate knowledge may lead to the application of inadequate steps in therapy, which may interfere with the recovery of the patient and damage well-being.

Venous origin

The first deformations indicating skin damage typically appear 6-8 years after venous thrombosis.

- Pathophysiology: capillaries dilate around the ankle; increasing permeability; fibrinogens enter the tissues, after which stasis develops; fibrinolytic activity of stagnant blood decreases, resulting in the emergence of induration. The activation of the thrombocytes and the coagulation system, increasing viscosity and then the opening of microshunts lead to the formation of ulcers.
- Due to perforant insufficiency (insufficient capacity of the muscle pump because of chronic venous occlusion) the following combined symptoms can be observed in the area in question: Ankle oedema, eczema, brownish pigmentation due to the accumulation of haemosiderin, and patients report painfulness and a burning, itching sensation of the area above the inner ankle. In case of superinfection a coherent coating can be seen with purulent characteristics. Its extension and size may vary, therefore it is important to observe medical directives before taking steps. Its treatment procedure requires the concerted actions of several professions.

Treatment steps:

Improvement of venous circulation (elimination of venous occlusion), compression dressing, increasing the muscular activity of the limb, local treatment, wound care

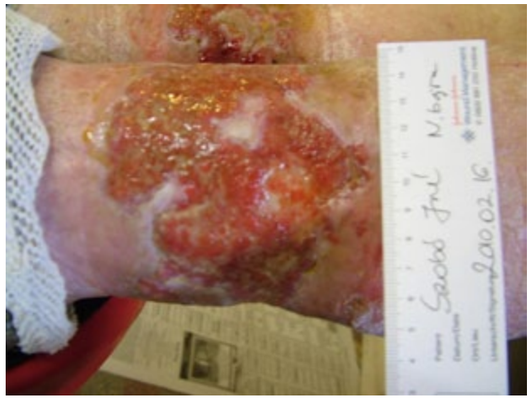
Arterial origin

- Inflammation, constriction and occlusion of arteries
- local arterial dilatation
- mixing of arterial and venous blood

- In contrast with the consequences of venous circulatory disorders, the nutritional insufficiency of tissues is in the centre here. Ulcers resulted form existing circulatory insufficiency are characterised by necrotic tissues and the absence of the epithelisation stage.
- It occurs on the peripheries and lateral areas of both lower limbs. The clinical picture is constituted by a dry or moist wound with much defluxion; the wound is often infected. *(Picture 6)*

Treatment steps:

- treatment of the primary disease; surgical solution
- local treatment, wound care



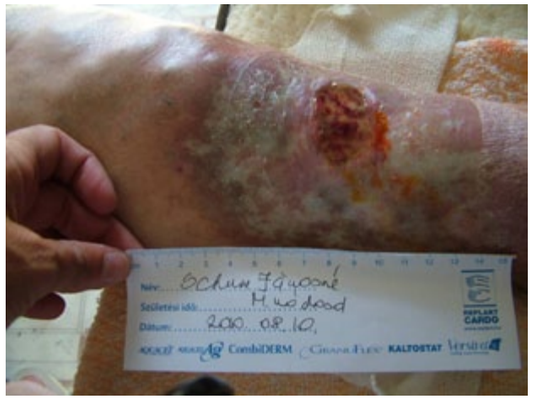
Pictures 6. Artériás eredetű lábszárfekély

Neuropathy

It has a significant role in the development of diabetes microangiopathy, foot ulcers occur as a result of the damage in micro-circulation. It causes the impairment of myelin sheaths and leads to impaired synaptic conduction. Neuropathy has an essential role in the development of "diabetes food" syndrome. Hyperaemic, infiltrated, scaly areas can be formed on the foot or leg, which often heal with pigmentation, giving a typical picture. Wounds having been regarded as insignificant often heal tardily and with complications. Clinical aspects are described further on. *(Picture 7)*

Treatment steps:

- balancing diabetes is of primary importance
- local treatment, wound care (subsequently)



Picture 7. Neuropathia okozta lábszárfekély diabetesben

Complex treatment of leg/foot ulcers

Therapy of chronic diseases as originating factors is essential besides the application of modern wound treatment devices and dressings. Wound care management is to be realised by the co-operation of all the involved professions.

In the case of chronic, slow-healing wounds evading superinfection is a basic principle. The treatment of the wound always has to be adjusted to the given wound healing phase, in detail to the type, condition and depth of the wound, the type and amount of the discharge, and not least to the assessment of the general condition of the patient. *(Picture 8)*

With the help of high quality wound care products moist wound treatment can be carried out for efficient nursing.

Physical wound cleaning: with skin and mycoderm disinfectors; cleaning of deep, cavernous wounds: by washing with iodine solutions and physiological saline.

Purposes of treating the necrotic wound: dehydration and scurf removal, enhancing autolysis, ensuring clean wound base for granulation tissue. The application of hydrogels is substantial at this stage. Indications for cavernous and non-cavernous wounds differ in the treatment procedure. In case of critically colonised, infected wounds – after cultivating the wound culture – the application of silver dressings is suggested, with professional recommendation. Systematic antibiotic treatment should not be forgotten about, depending on the results of the wound culture test. For the treatment of superinfected wounds with foul discharge carbon dressings are recommended in the treatment procedure due to their absorption capacity.

Purposes of treating the granulating wound: providing a healthy wound base for epithelisation; at this stage the usage of alginate dressings is emphasised. *(Picture 9)*

The epithelisation process is the last step in the treatment. Hydrocolloid dressings are highlighted, which provide optimal, moist wound environment in slightly deflucting, excoriated areas. (Kökény et al. 2008)

VAC-therapy is regarded as *new technology* in treating ulcus cruris wounds. This method is suitable for treating extended, large surface, cavernous wounds.

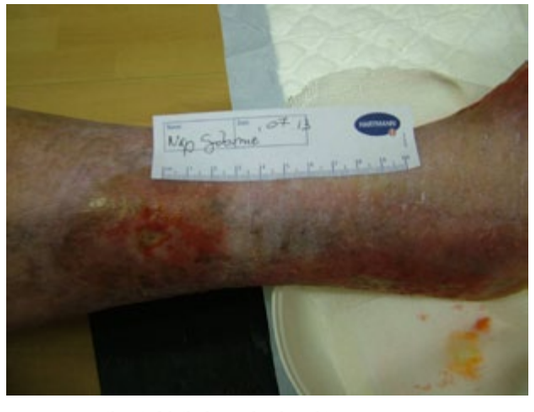
Besides advanced wound treatment methods *surgical interventions* must also be mentioned, since they have a role in any wound healing phase. In case of treatment of already cleaned-up wounds plastic surgical operations may be emphasised.

The use of compression therapy

Compression therapy, which provides external pressure, can be used for increasing venous tone, maintaining and increasing venous pump function.

Definition: providing external pressure (compression) suitable for treatment of venous and lymphatic limb affections by placing various (elastic or non-elastic materials) around the affected limb. This external pressure (compression) increases interstitial pressure in both superficial and deep tissues, which counteracts the increase of venous and capillary hydrostatic pressure responsible for developing oedema, together with emptying venous systems and contributing to the reduction of oedemas. Several other factors are involved in the fluid accumulation in the extravasal space, i.e. oedema. The physiological impacts of compression therapy are the following:

It reduces the diameter of the veins, venous pressure, venous reflux, flow speed, improves muscle pump function, contributes to the recanalisation of thrombi. It increases lymphatic return. It improves the micro-circulation of the blood on the arterial level. It also improves muscular tone, thus alleviating pain.



Picture 8. Lábszárfekély komplex kezelése

Characteristics of compression dressings:
Tension

During walking, pressure on the tissues of the lower limbs (at the traction of calf muscles) is increased, this is the operating pressure. The dilatation in a position of rest in a lying position is called the dilatation pressure. The applied bandage causes a certain tension. However, it is important to check the sub-bandage pressure so that high pressure cannot obstruct nor have unfavourable impact on arterial circulation.

Extensibility

The capacity of the dressing for its length to be increased. From this aspect, there are minimally extensible (short-stretch, inelastic, passive) and highly extensible (long-stretch, elastic, active) bandages.

Capacity

This feature determines the ability of the bandage to provide a constant amount of pressure when extended.

Elasticity

Elasticity shows the degree to which the bandage is able to regain its original (unexpanded) condition when tension is over.

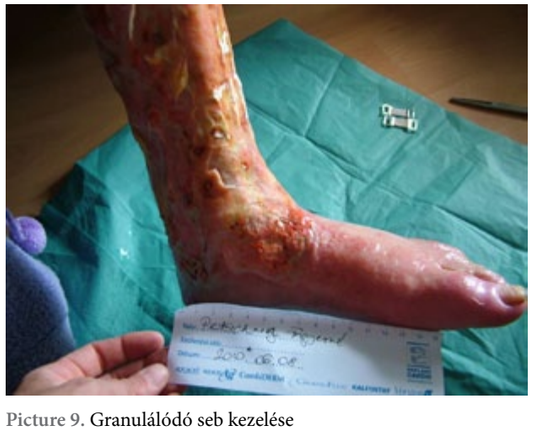
Elastic strips (swathes)

According to Laplace's law, compression (P) is determined by the compression bandage tension (T) and the radius of curvature of the limb (r): P = T/r.

This law modifies when applying elastic strips, since compression is also influenced by the number of layers applied (n), and the width of the bandage (a): P = Tn/ra.

Thus, the degree of compression is defined by four main factors:

1. the physical structure and elasticity of the bandage applied



Picture 9. Granulálódó seb kezelése

2. size and shape of the limb in question
3. bandage application method/technique
4. physical activity of the patient (Clark 2003)

Elastic bandages:

- They wear down easily; have to be replaced frequently
- Short, medium and long-stretch strips
- It is advisable to apply them in the morning *(Picture 10)*

Inelastic compression:

- Either short-stretch swathe or zinc-oxide Unna boots (gauze)
- To be applied in case of open leg/foot ulcers
- Application is similar to that of the former one, but it is applied without tension
- Fischer technique: a 10-cm wide piece of short-stretch bandage is placed over the zinc-oxide bandage, which is complemented on the thigh as well.

Elastic stockings:

- Compression degree (4) is determined by the pressure present over the (below 18 mmHg it is usable for prevention)
- Pressure gradually decreases upwards: 100% at the ankles, 70% on the calf, 40% on the thighs
- DEN is not identical to pressure, it only marks the number of fibres
- Length types: knee, mid-thigh, thigh-high, half or bilateral, maternity support stockings
- compression grade 3-4 stockings are open at the toes
- Size always needs to be determined individually *(Picture 11)*

Applying Elastic stockings:

- It is to be applied in the morning, following getting up and washing
- Silk socks make it easier to put on elastic stockings
- Creams cannot be applied under stockings
- Quality deteriorates after 4–6 months
- Not advised in case of foot/leg ulcer

Prevention

- Primarily the most important, least costly and most efficient therapy is prevention.
- Increasing the work of muscles by passive and active exercises; involvement of remedial gymnastics instructor. Besides simple exercise such as walking, and hiking, swimming and cycling are recommended.
- Obesity is to be avoided, involvement of dietician, lifestyle counselling; consumption of (commonly used) drugs is not advisable.
- Tight clothing is to be avoided, tight socks and circular garters are not expedient.
- Hot bath, excessive exposure of legs to direct sunlight are not allowed. In summer cold shower applied on the limbs is beneficial.
- Continued sedentary work or work requiring a standing position effects venous circulation negatively, which can be improved with compression therapy. At rest, the elevation of the feet or leg is beneficial.
- The importance of footwear cannot be overemphasised. Fashion does not always adapt to the aspects of comfort, choosing shoes requires circumspection. If any problem occurs it is advised to consult an orthopaedic physician. Careful and tender podiatry is necessary, as well as to minimise risk of trauma, and to prevent fungal infections.
- Class I. of compression therapy includes that it is very important to treat even moderate complaints in time. After all, the negligence of compression therapy can be found at the bottom of 50% of unsuccessful therapies and the recurrence of ulcers.

Diabetic foot

In case of diabetes heterogeneous pathological changes (in this respect neuropathy, diabetic macro- and micro-angiopathy, structured deformities of bones and joints, infections are crucial) lead to the emergence of "diabetic foot", the typical chronic complication of diabetes.

Local symptoms appear, and due to the impairment of sensory parts these parts become insensate, this is why most patients cannot sense smaller traumas. Due to motor innervations the atrophy of small muscles begins, then the thinning of the fat pad of the foot sole, which lead to a change in statics. New pressure points are formed on the soles, calluses and micro-haematomas appear, which is followed by ulcer formation within a short period. The presence of clefts resulting from dry skin contributes to infections. There is a high risk of inflammation between different skin layers affecting joints and bony parts; this condition favours the emergence of osteomyelitis. A mild case of inflammation can mean moderate cellulitis infection accompanying foot sole ulcer, but in more serious cases sole phlegmone or abscess may occur. (Rozsos 2001) *(Picture 12 a, b)*

External factors can also increase the risk of diabetic foot; the following are the most important: uncomfortable footwear, harmful heat effects, chemical damages, inappropriate pedicure, foot or toenail mycosis, lack of general and foot hygiene.

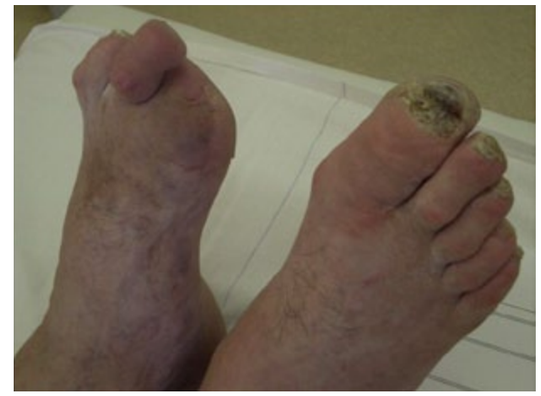
With the progression of the pathography, bone and joint deformities and vascular affection may also be involved. The foot becomes markedly deformed, subluxation is present. *(Picture 13)* Marked oedema may appear on the limb, especially due to infections. *(Picture 14)*

There are three stages in the disease process of diabetic foot:

- Stage I:
  - mild – not endangering the whole limb
  - superficial ulcer, with mild defluxion
  - absence of cellulitis
- Stage II:
  - moderate – endangers the limb
  - deep tissue ulceration, purulent discharge
  - osteomyelitis without septic symptoms
  - presence of cellulitis
- Stage III:
  - severe – endangers life
  - the above mentioned symptoms, plus extensive necrosis, gangrene with septic symptoms

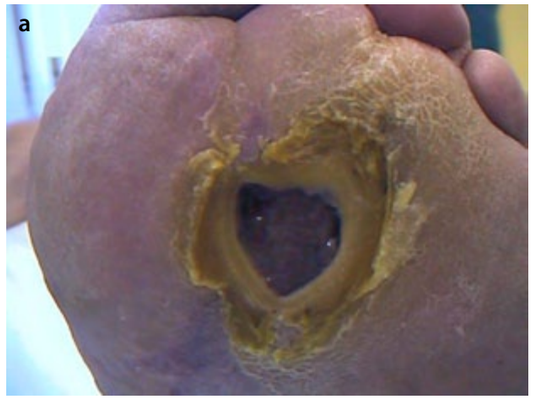
Picture 10.
Elasztikus fáslik

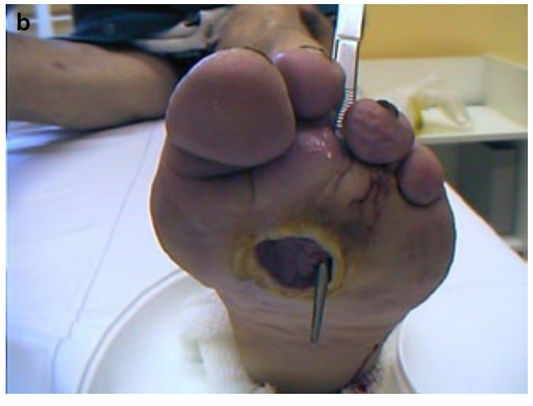
Picture 11.
Elasztikus harisnyák



Picture 13. Diabeteses láb, a lábfej deformálódása

Pictures 14. Diabeteses láb,
az alsó végtag oedemája





Picture 12. a, b. Diabeteses láb

The consequence of diabetic neuropathy affecting sensory nerves is the malum perforans pedis, i.e. neurotrophic ulcer.

Typical deformations:

Neuropathy, foot deformities, changes in statics, hyperkeratosis on the pressure points, pitting occurs under pressure points (keratolysis) which can be infected, cellulitis, necrosis spreading onto deeper tissue layers.

In contrast to non-diabetic constriction, diabetic angiopathy primarily affects peripheral veins. It is not exclusively micro-angiopathy. The media of the veins running to the muscles can calcify circumferentially so severely that it becomes completely incompressible, and in this case the Doppler test can give inappropriate results.

Diagnostic options

- Physical examination: deformities, calluses, injuries, ulcers, interdigital mycosis, fungal nail infections, ingrown nails, colour of the skin, body temperature, peripheral pulse.
- X-ray examination: calcified veins, articular diseases, osteomyelitis.
- Doppler-test: blood-flow test
- Angiography is indicated if: walking capacity of the patient drops below 200 metres,
- If Doppler index drops to about 0,5
- Pain in resting position
- Neuropathy examination: touch sensation testing – monofilament test for fine touch testing.
- Vibration sense testing: with calibrated tuning fork on both limbs, on several spots.

Diabetic gangrene

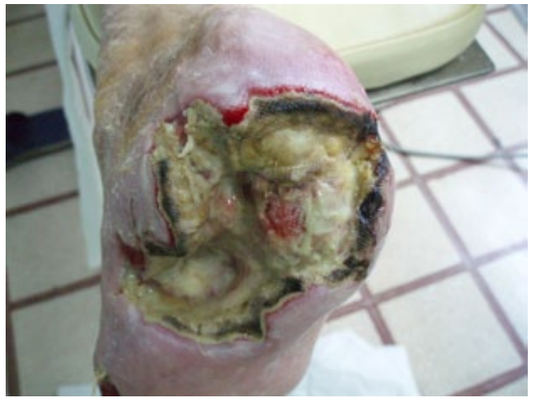
Infections are extremely aggressive on diabetic feet. They often spring from insignificant lesions but then spread very quickly. They are always caused by mixed flora (Gram+, Gram- and anaerobic bacteria). *(Picture 15)*

Due to the peculiar anatomic structure of the feet they penetrate deeply very rapidly. Osteomyelitis can occur very quickly. Amputation is often unavoidable.

Gangrene treatment *(Picture 16 a, b)*

General treatment: adjustment of the unbalanced blood sugar level, positioning of the limb in a resting position, broad-spectrum antibiotics therapy, relieving footwear, rehabilitation, institutionalised care.

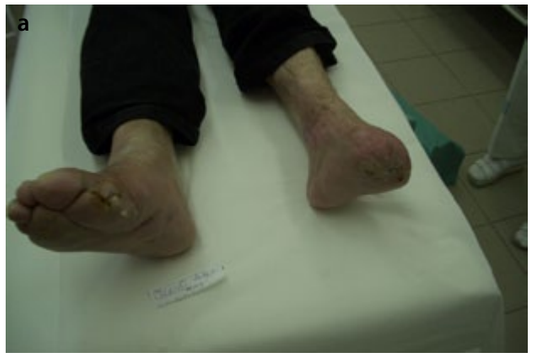
Surgical treatment: necrectomy, culturing bacteria from superficial and deeper areas, targeted antibiotics therapy, reconstructive vein surgery; ultimately amputation.

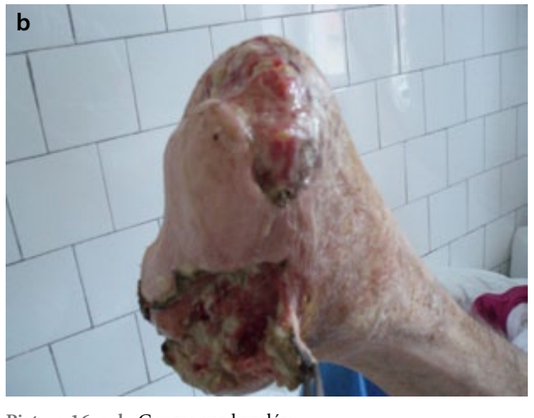


Picture 15. ábra. Diabeteses gangraena

Treatment of tumorous wounds

Concerning the care of patients suffering from tumorous diseases and receiving palliative treatment, tender and humane care and treatment should be emphasised above all. Every effort should be made to treat wounds in accordance with the professional rules even at the final stage of the disease. The use of odour and moisture absorbing dressings are prominent in any wound dressing protocol, and in case of crateriform wound irrigation is emphasised, adjusted to its condition.





Picture 16. a, b. Gangraena kezelése

Decubitus

Decubitus prevention

In case of patients suffering from or exposed to a risk of pressure ulcers holistic care is required. These wounds cause severe pain and possibly unpleasant odours impacting on the physical condition of the patient, and often harming them psychologically as well, leading to isolation for the patient. Therefore the anamnesis should attempt to assess psychological and social needs besides physical factors. *(Picture 17)*

Comprehensive nursing anamnesis is necessary which pays attention to the somatic, psychological and social needs of the patient. During physical examination the nurse assesses the condition of the skin and the presence of chronic wounds. On the first encounter with the patient – within 6–24 hours from admission – risk assessment has to be carried out. Risk assessment includes the assessment of the above mentioned risk factors by taking the medical history, and classifying the patient's risk rate with the help of some assessment scale. Among these the Braden, Norton and Waterlow scales are the most common, but Skanon and Gosnell scales are also used, especially in Anglo-Saxon countries. Each scale marks the risk of decubitus ulcers in individual patients using various risk factors with a scoring system, where the lower the score, the higher risk it means.

From all these scales the Braden scale shows the highest level of sensitivity and specificity, the Norton scale is less sensitive, but there is no significant difference in its specificity.

According to a survey conducted in Hungary mainly the Norton scale is used for the risk assessment of endangered patients (81,3 %), and 6,45% is the application rate of the Braden scale. The Modified Norton Scale (ENS) is especially widespread in Hungary, since preventive activities can be planned easily based on the score values of this scale. (Schoonhoven et al 2002)

Theses scales are suitable not only for the assessment of the patients' condition but also for planning the nursing process, but they cannot replace inspection, physical condition assessment and anamnesis.

Patients falling in the no-risk category do not require prevention momentarily, but of course in case of any change in their condition the assessment needs to be repeated as soon as possible (within 2 hours). In the medium risk category risk assessment is to be repeated in definite periods (usually in every 3 or 4 days), and preventive activity needs to be started. In case of high risk more frequent, daily reassessment is necessary, accompanied with prevention.

Risk assessment (based on risk assessment scales and clinical judgement) and documentation is an individual nursing competency.

The prevention of pressure ulcers includes the following nursing activities.

Skin care: the assessment of skin condition needs to be carried out daily, paying special attention to pressure points such as the sacrum, the trochanter, the heels, etc. The condition of the skin also refers to the general condition of the patient. A full skin condition assessment of each patient is necessary to be carried out within six hours from admission. (National Guideline Clearinghouse = Skin safety protocol: risk assessment and prevention of pressure ulcers. – 2007.)

Factors of perpetual control:

- Moisture content of the skin
- Skin temperature
- Pigmentation, such as pale, red or livid stains
- Presence of non-blanchable erythema
- Oedema, wounds, blisters, rashes

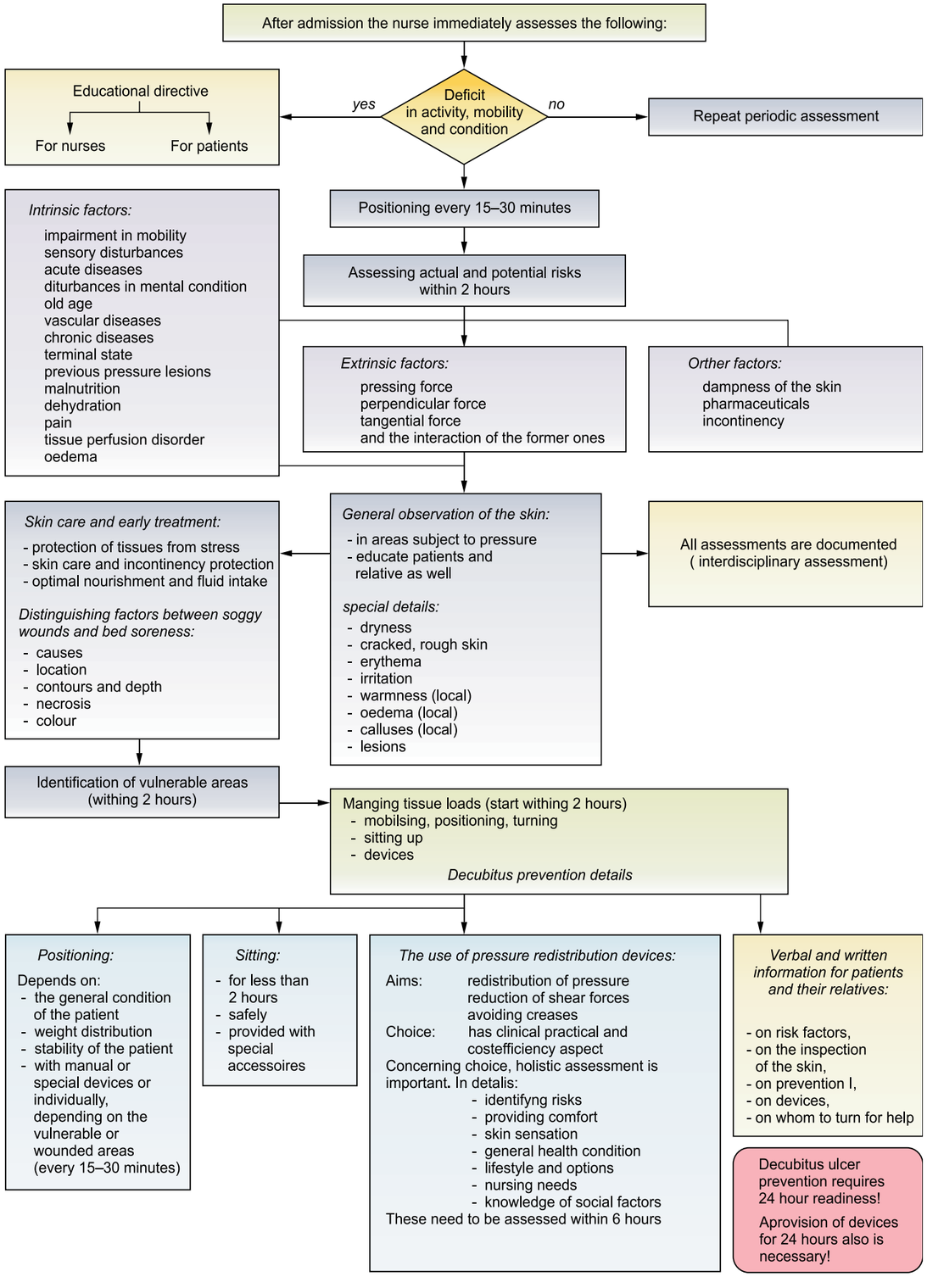
Non-blanchable erythema is an indicator of the need for pressure redistribution, but non-blanchable redness also signs present or impending tissue damage. The assessment of the condition of the skin can be carried out simultaneously with other interventions. During oxygen therapy the condition of the ears or the areas under pressure from the rubber band/mask/tube can be inspected. During chest examination, or when the patient lies on the side, the regions of the shoulders, the back, the sacrum and the coccyx can be inspected. During the checking of bowel sounds we can inspect skin turgor. When checking intravenous punctures or administering infusions the condition of the elbows and the arms can be inspected. Check skin regularly after removing fastening devices (e.g. splints, plaster-bandages, etc.), especially on areas where anaesthesia occurs or occurred.

In order to satisfy hygienic needs nursing is personalised – application of skin protecting products, avoidance of too hot water and strong rubbing; in case of incontinent patient thorough skin care is extremely important after defecation and urination. For dry skin the application of special moisturising products is recommended, as well as minimising environmental factors causing dryness such as low humidity and cold air.

Reducing friction and shear stress:

The reduction of friction and shear can be accomplished with professionally correct moving and handling techniques. Depending on the condition of the patient, the head of the bed should be elevated no more than 30 degrees; if the patient is lying on the back, this position exerts the least amount of pressure (Defloor 2000). When moving the patient in bed, do not slide, pull or drag; use lifting devices and comply with minimal personal conditions during mobilising activities.

The frequent use of hypoallergenic creams and lotions reduces surface-tension and friction on the skin. Film dressings



Picture 17. Predictive and preventive algorithms of pressure ulcers (Source: SEBINKO Szövetség, Konszenzus anyag, 2006)[62]

and hydrocolloid dressings applied over bony areas reduce friction.

Before placing the patient on a bedpan, take care of skin safety, do not pull or push but lift the bedpan under the patient. Excessive dampness weakens the integrity of the skin and destroys the outer lipid layer. Therefore even a small degree of shearing force is enough to develop wounds on the surface of the skin.

Minimising pressure

Immobilisation is the most significant risk factor in the development of pressure ulcers. (Krishnagopalan et al. 2002). Immobile patients should be repositioned at least every two hours, while bed-bound patients need to be helped to reposition every hour. Several studies have been carried out concerning the positioning of patients, especially with respect to the frequency of turning. The most widespread practice is repositioning every two hours, which is part of most preventive recommendations, according to which such plans are to be created in which the patient is regularly (every 2 hours) repositioned in a way that every part of the body is freed from the effects of pressure. It must be emphasised, however, that a rigid turning regime does not serve the interests of the patient, since it has to be personalised and customised to the conditions of the patient. New-generation devices and a world-wide reduction in nursing numbers have led to an increasing number of researchers studying pressure redistribution devices together with the frequency of turning, defining longer and longer periods. According to Defloor (2005), the use of viscoelastic foam mattress combined with 4-hour repositioning is the most efficient, moreover, it is also the most viable solution considering costs and nursing work.

Picture 18. Nyomás újraelosztására alkalmas matrac nyomási fekély megelőzésére

In order to minimise pressure in case of bed-bound patients slight repositioning is needed frequently, with the use of cushions or wedges to reduce pressure on bony areas. Repositioning is required at least every two hours. Patients lying on their side should not lie directly on the trochanter!

Pressure redistribution mattresses / surfaces are needed in case of patients having been assessed as medium risk. *(Picture 18)*

The management of incontinent patients:

Incontinence has to be indicated in the records of the patient in each case; identify its type and make a management plan. Urinary incontinence can be a harbinger of the development of pressure ulcers, because it causes skin irritation and increases friction. Faecal incontinence is an even greater risk factor, since faeces contains bacteria and enzymes which are harmful to the skin; they increase the pH of the skin because the enzymes transform carbamide into ammonium, and the alkaline-pH skin is more permeable for other irritants.

Check on the incontinent patients at least every two hours and as needed. Always clean the skin carefully after dejection, and remove impurities with water or skin-friendly-pH detergents. Avoid excessive rubbing which may further traumatise the skin.

The use of faecal incontinence products: in Hungary the use of pads and pants is conventional, but various other faecal incontinence devices such as draining and collection systems are available.

Nourishment:

Malnutrition is a significant risk factor in the development of decubitus ulcer, which can be treated by dietetic therapy that slows the development of ulcers and fastens the process of wound healing. According to international recommendations after assessing the patient's nourishment condition 30-35 kcal/kg of nutrients and 1-1,5 g/kg of protein daily intake needs to be provided, and a diet rich in arginine, antioxidant vitamins and zinc contributes to wound healing. It is to be taken into account whether the patient is able to ingest food containing the above nutrients, or supplementary feeding is needed in form of nutritional supplements (e.g. Cubitan). The fluid need of patients is 1ml/kcal, so maintaining hydration is a particularly important task.

Nursing anamnesis needs to include the assessment of risk factors endangering the patient, among others the assessment of the patient's nourishment condition. Several surveys have been made on patient nourishment condition in hospitals and permanent care institutions in Hungary. According to these surveys inpatients in the above mentioned institutions often suffer from malnutrition which is a significant risk factor of decubitus ulcers. (Kondrup et al. 2003) Several methods can be applied to assess nourishment, the directive of Ápolási Szakmai Kollégium includes a detailed guide of these and of the tasks of the nurse.

Documentation/ records

Records include risk assessment, the assessment of the nutritional condition of the skin and the physiotherapy anamnesis. Appendix 6 presents an optional sample.

Patient education

Patient education is a pre-planned and organised task including verbal and written education of the patient and relative on the following:

- causes and risk factors of the development of pressure ulcers
- use and evaluation of risk assessment scales
- skin inspection and skin care
- choosing and applying pressure reducing devices
- nourishment
- incontinence care
- positioning, pressure release, transfer and lifting techniques/devices

Anti-decubitus devices and their use in practice

Two basic types of special anti-decubitus devices can be found:

- *Static devices providing* a constant low pressure
  - mattresses and overlays made of high-specification (alternative) foam
  - medical gel-filled mattresses/overlays
  - fibre-filled mattresses/overlays
  - air-filled mattresses/overlays
  - fluid-filled mattresses/overlays
- *Dynamic devices providing* alternating pressure
  - alternating-pressure devices with incorporated pressure
  - air-blow devices with pulsating dynamic pressure
  - low air loss devices
  - kinetic beds

Alternating-pressure and low air loss devices and kinetic beds are not only preventive but serve the aims of therapy as well. The goal of the use of pressure-redistributing equipment is to redistribute pressure, to reduce shear forces and to avoid creasing. Choices depend on clinical, practical and cost-efficient aspects. Pressure-redistributing devices have a favourable effect on the deformation of tissues and at the same time they reduce shear forces and creasing, thus reducing the risk of decubitus. (Whittermore 1998)

The following, so-called "old-style" convenience devices do not qualify as anti-decubitus equipment, and neither the protocol nor the professional consensus recommends their use for high-risk patients:

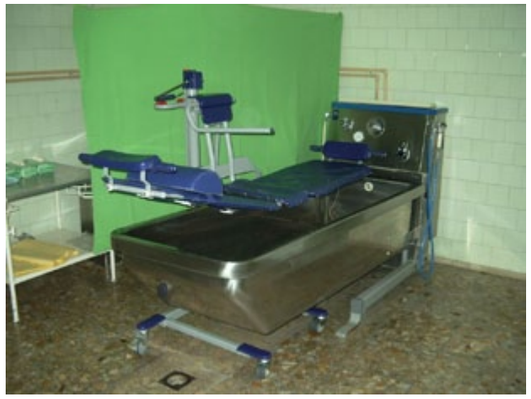
- water-filled pillows and gloves
- air-filled non-specific pillows
- mattresses and pillows made of a single piece of polyurethane, even if they are confined in a special casing

Picture 19. Matracalátét decubitus megelőzésére

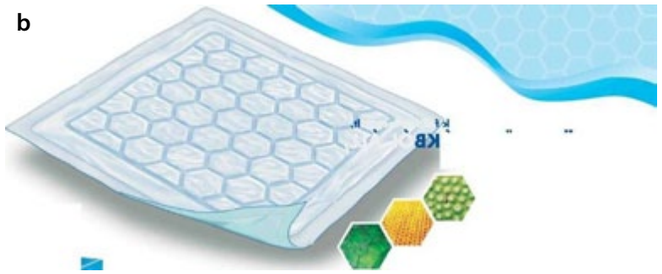
- mattresses and pillows made of a single piece of polyurethane, even with different surfaces (egg-crate, cubed)
- doughnut-shaped polyurethane cushions and rings (for elbows and heels)
- sheepskin or false sheepskin

Modern therapeutic devices:

- Mattress underlay systems: in case of stage II. decubitus *(Picture 19)*
- Wave-shape, extended support surface. There is an extended surface for protection; the patient is alternately supported on one of the surfaces and cannot slip off even when sitting.
- Anti-decubitus mattress with motor: its working principle is similar to that of ripple mattresses. It is a special automated, alternating-pressure air-flow device. The device adjusts the optimal pressure conditions to the body weight of the patient with the help of sensors. It reduces the pressure on the patient by 18 mmHg. Patients at low or medium risk can be provided with alternating positioning.
- Patient lift systems for mobilising have been designed primarily for lifting, and secondarily for bathing, showering, toilet needs. *(Picture 20)*
- Single and dual-chamber anti-decubitus seat cushions: The air flowing between the chambers ensures ventilation for the skin. They are applicable in case of high-risk patients. Pressure can be regulated with a valve in dual-chamber cushions. *(Picture 21)*
- Ripple mattress: used as an overlay. It is constructed of adjacent cylindrical cells which inflate and deflate in alternation. The surface executes undulatory motions, so the period of impact on bedsore points is limited.



Picture 20. Betegemelő rendszerek



Picture 21. a, b. Egy és két légkamrás antidecubitus-ülőpárn

- Pegasus Airwave system: It is constructed of dual-layer cylindrical cells (20-cm thick), and pressure is periodically reduced to 0 mmHg by deflating every third cell periodically in every 7.5 minutes for 2 minutes. Air-flow is provided through plenty of air-holes to keep skin dry. *(Picture 22)*

Special beds

- L.A.L (low air loss): consists of 20-25, 30-cm high, 90-cm wide textile fabric sacs. Segments are kept inflated with pressurised, tempered air-flow, and these segments constantly lose air through the pores of the fabric. It provides for a very low pressure.
- Dry flotation: a "tank" filled with fine, grain-sized glass beads. The pressurised air flowing upwards attributes liquid characteristics to the glass powder. Very good pressure-relieving effect can be achieved. *(Picture 23)*
- Air-fluidised bed: warm compressed air circulated through ceramic beads lifts the sheet which assumes the characteristics of the "liquid medium". It ensures a support pressure below the capillary closing pressure.
- Circular bed: support surface located in the diameter of a parallel ring. The patient can be laid on the stomach and the bed can be sloped as well.
- Anti-decubitus viscoelastic mattress: made of viscoelastic foam which moulds to the shape of the body.
- Guttman-bed also belongs to devices helping with turning the patient. It turns the patient from prone to supine position and from one side onto the other. Kinetic therapy turns the patient to another position in every three minutes.

Picture 22. „Air Wave" (léghullám) Pegasus-rendszer

Picture 23. Decubitusprevenciót szolgáló ágy

Decubitus therapy

Decubitus means bed sore or pressure ulcer, and it roots in the Latin verb *decumbere* meaning 'lie down'. It can develop not only in lying but in prolonged sitting position as well. Since prolonged pressure is common in both cases, the term 'pressure ulcer' is more appropriate.

Pressure ulcer is probably as old as humankind. The earliest evidence found is a mummy of an old Egyptian priestess from the age of dynasty XXI with sizeable decubitus ulcers on the sacral and scapular areas which also bear the traces of the first memories of wound dressing or even skin transplantation, since the wound was covered with pieces of soft gazelle hide.

It is a break in the integrity of the skin or the subcutaneous tissue caused primarily by pressure, shear or friction, or the combination of these. Prolonged pressure hinders the oxygen and nutrient intake of the tissues and the exhaustion of pathological metabolites, which lead to the development of tissue ischaemia. The degree of the damage depends on the force and time length of the pressure and the endurance of the tissues. The following notions have a role in the pathogenesis of decubitus ulcers:

- *Shear:* a kind of pressure on the skin present when the mobilisation and positioning of the patient is carried out by dragging. The skin and the subcutaneous layer sticks to the surface of the bed, and the bones and muscles also move to the direction of the movement of the body.
- *Excoriation:* lesion caused by the friction between two surfaces.
- *Moisture:* the resistance of the skin against pressure decreases
- *Poor nutrition:* muscular atrophy, the thinning of the connective tissues under the skin
- *Peripheral circulatory problems:* the tissue with decreased circulation becomes hypoxic, and if this condition endures, ischaemia, or progressively tissue necrosis develops.

Risk factors

Those patients are at risk in whose movement is decreased by one or other factors. These include e.g. certain neurological diseases involving paralysis, unconscious states, long surgical interventions in anaesthesia, taking sedatives (benzodiazepine). If intravascular pressure reduces (e.g. shock, dehydration) or the oxygen supply of the cells is disturbed, e.g. in case of anaemia or peripheral arterial occlusion, tissues are more likely to injure. Nutritive supply is also an important factor (e.g. malnutrition), and a decrease in the endurance of the skin can lead to ischaemia easily (dry and atrophic skin in case of the elderly, and the thin skin of babies).

Pressure ulcers develop first on the skin over bony or cartilaginous portions. In a prone position these are the sacrum, the coccyx, the heels, the elbows and the occipital; in a lateral position the trochanter, the ears and the cheekbones, the shoulders, the inside and outside of the knees, the outer ankles; and mainly the ischial bones in a sitting position.

The classification of the stages of pressure ulcers

Stage 1: non-blanchable erythema on intact skin surfaces. Coloured stains, warm feeling of the skin, induration and oedema also may be signs especially in case of individuals with a darker skin. *(Picture 24 a, b)*

Stage 2: partial erosion on the surface or under the skin, or in both areas. The ulcer is superficial, and from a clinical aspect it can be regarded as abrasion or blister. *(Picture 25 a, b)*

Stage 3: full erosion with the lesion or necrosis of subcutaneous tissues which can reach to the fascia but does not extend to it. *(Picture 26 a, b)*

Stage 4: extensive damage, tissue necrosis, or muscle, bone or cartilage injury with partial or full erosion. *(Picture 27)*

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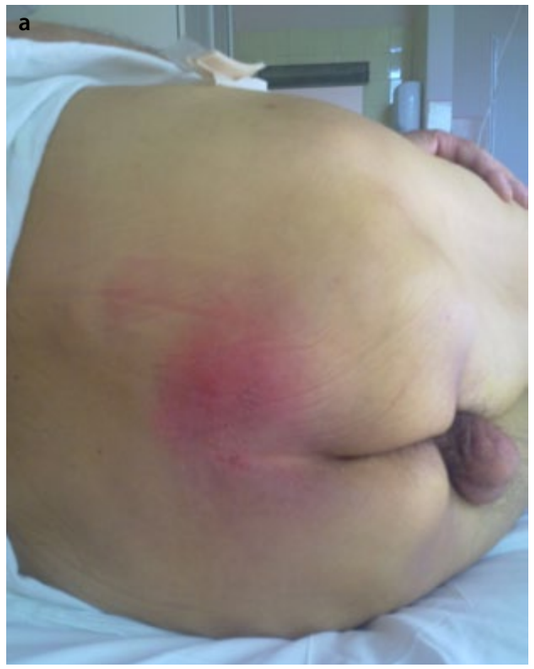
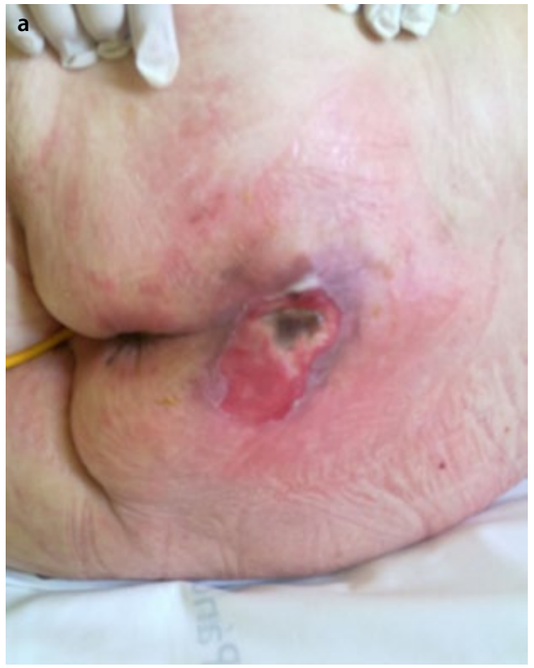
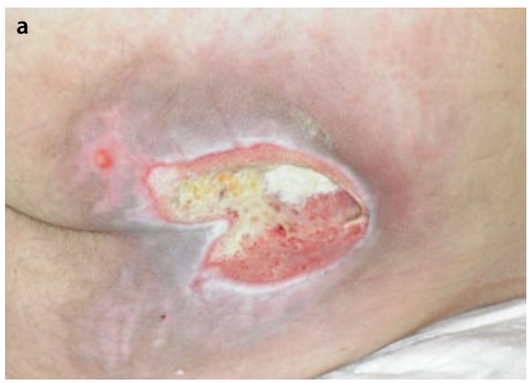
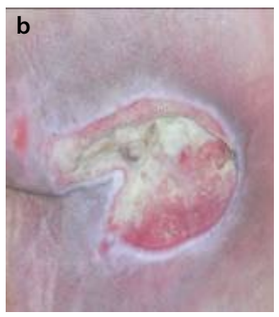


Picture 24. a, b. Nyomási fekély 1. fokozata

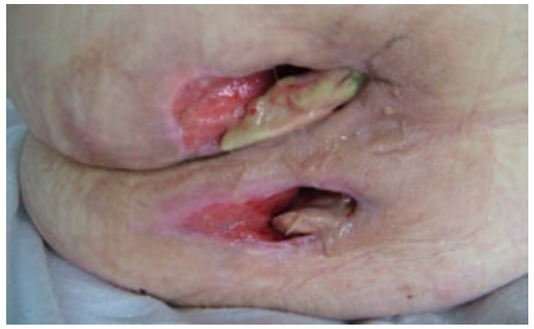


Picture 25. a,, b. Nyomási fekély 2. fokozata



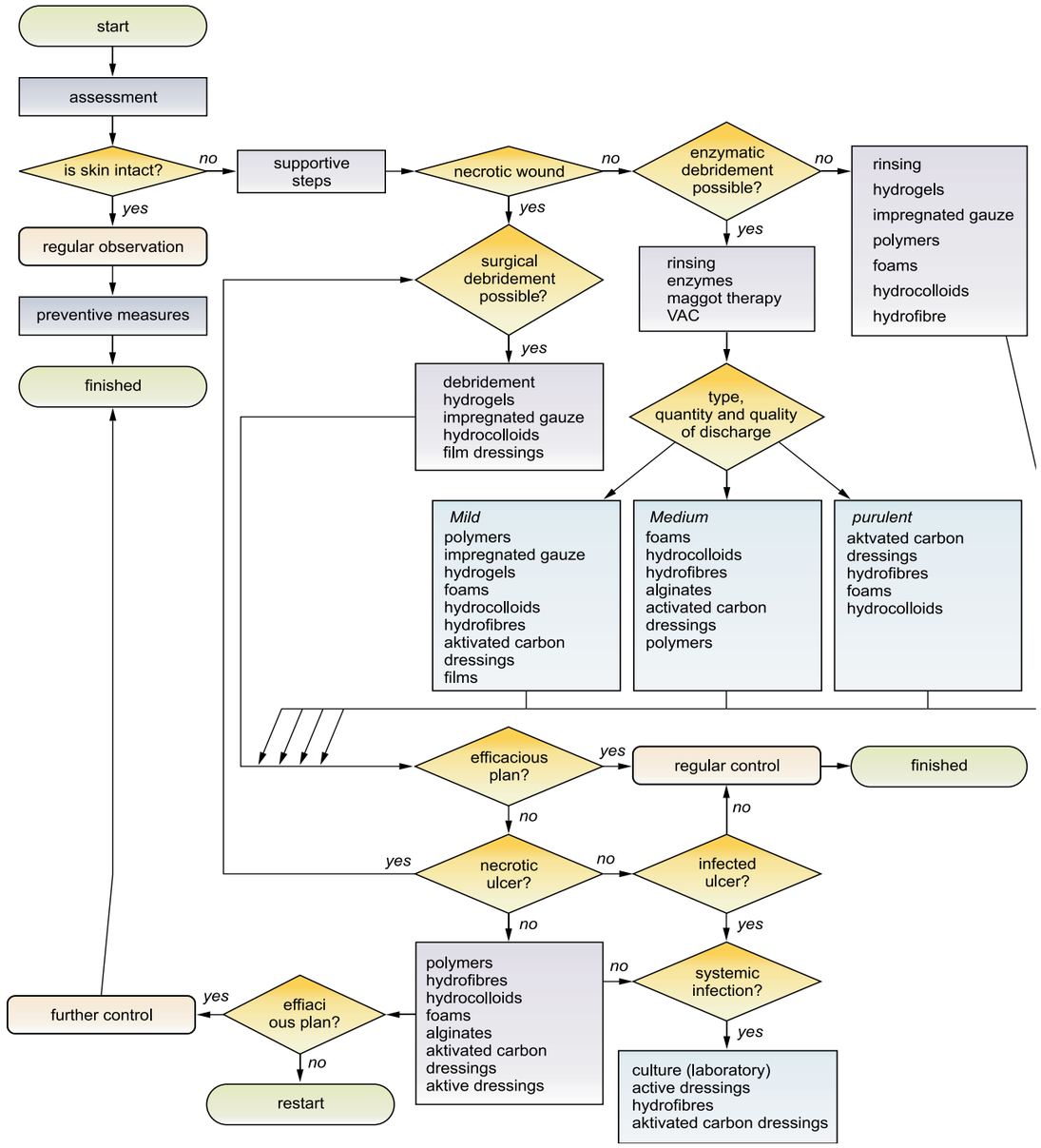


Picture 26. a, b. Nyomási fekély 3. fokozata



Picture 27. Nyomási fekély 4. fokozata

Picture 28. Local wound care algorithm for pathologic wounds (ulcers) (with a highlight on the choice of dressings) (Source: SEBINKO Szövetség, Konszenzus anyag, 2005)[70]



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28. The Basis of Nuclear Medicine

BY PROF. PH.D. PÉTER BOGNER, PH.D. KATALIN ZÁMBÓ

Isotopic imaging

The pictures taken by isotope imaging procedures reflect the distribution of radioactive elements injected into the body. The radioactive isotope of an element bound to a molecule (radiopharmaceutical) reacts the same way in the body as the non-radioactive molecule that is it takes part in the normal or pathogenic function of organs thereby the function of body organs can be made visual. These pictures primarily can be detected by gamma cameras or in the past few decades by SPECT (single photon emission tomography). The gamma camera forms images of the radioactive source emitting gamma photons in a similar way as a camera, at the same time sharing some similar features with X-ray imaging.

The main components of a gamma camera can be seen in *Figure 1*.

Each component has a specific function to convert the picture of gamma photon into a light-image, then to form images accordingly. The first component is the collimator which is in charge of the gamma photons leaving the patient perpendicularly –and being suitable for imaging- to reach the scintillating crystal and it absorbs diffuse radiation. The scintillating crystal absorbs gamma photons and converts them to light photons. The intensity of the light image formed on the opposite side of the crystal is extremely low so it could not be seen directly. This is the reason why a photoelectron multiplying system must be applied which has a specific double function, on the one hand it converts the light image into an electronic pulse, then it intensifies it, on the other hand it localizes the electronic pulse. The electronic sign, coming out of the photoelectron multiplying system, consists of three components; one of them represents the energy of the gamma photon, while the two other electronic signals localize the position of the previous signal on the area of the image. The electronic signal representing the energy of the photon is detected in the sign analyser, which facilitates to visualise the appropriate part of the energy spectrum. The information obtained from the signal analyser makes further computer data processing possible, as well.

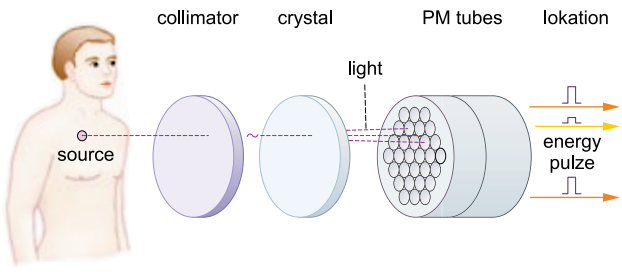


Figure 1: Imaging of gamma camera

The image formed by a gamma camera is of relative spatial count density and enables to judge the shape, the size of the given organ/ lesion only restrictively. Spatial resolution capacity depends on the detecting device itself and the size of the examined organ/lesion, its location and the radiopharmaceutical concentration. At the same time the isotope diagnostic methods are extremely sensitive, small size lesion can already be detected, if it is enriched intensively by the radiopharmaceutical and the functional change precedes the morphological lesion. Furthermore, it is an important distinctive feature that several physiological and pathophysiological functions, processes can be followed; therefore isotope diagnostics primarily provides functional information, not structural or anatomical details.

Besides imaging by a gamma camera, two other important devices of isotope diagnostics (recently it has been called nuclear medicine because it includes radiotherapy) have been developed in the last decades.

- SPECT, which turns several, 2 or 3 detector heads of the gamma camera around the examined part of body and reconstructs 2D cross sectional or 3D images from the collected data.
- PET (positron emitting tomography), which can detect radioisotopes emitting specific positrons (positive electrons). The emitted positron can travel in tissue for a very short distance, as at the encounter with an electron in the course of annihilation radiation both of them decay, or convert into two gamma photons with extra strong energy, which leave the place of annihilation at almost 180 degrees to each other. The PET camera consists of detectors disposed ring-like, which can detect the produced two photons, reaching the detectors on the opposite side very quickly and can determine the exact location of annihilation by the help of a special electric circuit.(PET is a two photonic while SPECT is a single photon emitting computer tomography.)

Nowadays the fusion process has been increasing in the field of imaging diagnostics, when images are taken by two types

of imaging modality, techniques, by hybrid devices, suitable for this. At present SPECT and PET cameras are combined with tomography based on X-ray photon (CT, PET/CT, SPECT/CT, what is more PET/MR is on its way), Thus it is possible to detect SPECT, PET the images, at same time and position without moving the patients, after which the different images can be fused. These fused images contain the accurate functional (SPECT, PET) and structural (CT) information, as well.

Positron radioactive form has a number of atoms making up the tissues, these, put into an organic molecule, can be administered into the body , thus different metabolic processes, the synthesis of hormones, blood provision of certain organs can be studied. The most common radioisotope is fluorine (F18 – deoxyglucose), but C, N, O atoms can be "marked". The marked glucose molecule provides information about the sugar metabolism in the body, which e. g. can typically change that is it is intensified in the tumorous tissues.

The general characteristics of isotopic examinations:

- organ-specific – labelling isotope is (99mTc) +radionuclide
- they are based on the function of the given organ or organ system
- they can be carried out easily (by administering an intravenous injection)
- they require no special preparation (only certain gastro-intestinal examinations require empty stomach)
- they are free from complications with minimum risk factors (no risk of allergy)
- sensitive but nonspecific methods
- they are suitable for follow on therapy

Types of examinations:

- *Static scintigraphies:* the distribution of radiopharmaceuticals is inspected in a given organ at an optimal time (it depends on the organ to be examined), after the radiopharmaceutical has been administered, by producing layer images (SPECT) or images from different directions.
  - Positive scintigraphy-the circumscribed increase of activity is pathogenic.
  - Negative scintigraphy: the circumscribed lack of activity (focal defect) is pathogenic.
- *Dynamic examinations:* a series of images since the administration of pharmaceuticals at a certain interval, calculation of parameters from the time-activity graph (function).

Radiation Protection

The most important principle is the so called ALARA-principle (As Low AS Reasonable Achievable), that is radiation should be as low as reasonably achievable. The profitable rate of risk must be estimated. It must be founded on the appropriate indication of examination; the greatest radiation loading can be caused by the examination performed in vain. General guidelines to follow: isotope examination should be performed only in exceptional cases in case of pregnant women (e.g. perfusion lungs scintigraphy in case of pulmonary embolism). In case of children special care must be taken of the doses calculated per kilograms.

Radiopharmaceuticals

The dose of applied isotopes is determined for different examinations, its ‚measurement is' megaBequerel' (MBq). 1 Bequerel= 1 decay/secundum.

Table 1. The most commonly applied radionuclides in isotope diagnostics

Isotope	Energy (keV)	Half-lives	Examination	Production
Tc-99meta	141	6.03 h	brain, thyroid, heart, lungs, liver, bone, etc.	generator
Tl-201	68–80	73.1 h	heart muscle	cyclotron
I-131	364	8 nap	thyroid, tumour+therapy	reaktor
I-123	159	13 h	thyroid	cyclotron
Ga-67	93, 185, 300	78.1 h	tumour detection inflammation	cyclotron
In-111	172	2.81 day	tumour treatment, immunoscintigraphy	cyclotron
F-18	b+	109 min	PET	cyclotron

Table 2. Radionuklid dózisa az egyes vizsgálatokban

Pharmaceuticals	Isotope	Dose	Organ examined	Name of examination
macro-albumin	Tc-99m	15–200 MBq	lung perfusion	lung scintigraphy
thallium chloride methoxy-isobutyl isonitrile (MIBI), tetrofosmin	Tl-201 Tc-99m	74 MBq 600 MBq	myocardial perfusion	inactive inactive and functional myocardial perfusion
hexamethyl-propyleneamine-oxime (HM-PAO)	Tc-99m	800 MBq	cerebral blood flow	cerebral perfusion
diethylene-triamine-penta-acetic acid (DTPA)	Tc-99m	600 MBq	perfusion of several organs (heart, bone, kidney, etc.)	dynamic perfusion exams

1 MBq=10 decay/ secundum (Bequerel, a French scientist invented radioactivity).

In certain diseases the blood flow of the organs is altered, in most cases it is decreased in comparison with the normal flow. The activity of the applied pharmaceuticals is lower at the area of the abnormal vein.

Perfusion lung scintigraphy

Basic principle: the protein granules, administered intravenously and labelled by gamma-emitting isotope are blocked in a part of the precapillary system of the lung (as the size of the granule is bigger than the size of precapillary arterioles), distributed proportionally with the rate of the lung perfusion. Thus it indicates the actual condition of blood division.

Indications:

- in case of suspected pulmonary embolism the determination of the number of perfusion defects, their localization, their expansion, the estimation of embolism by combining X-ray and inhalation examinations
- detection of recurrent embolism compared with previous scintigrams, tracing therapy
- the estimation of the function of the rest of the lung after the operation by computer-aided detection of the counts of the specific parts of the lung before the operation
- detecting the regional change of perfusion in obstructive lung disease (COPD)

Patient preparation is not necessary. In case of potential pulmonary embolism the patient should be carried in lying position.

Inactive and functional myocardial perfusion test

Basic principle: the examination of regional and relative blood supply of the myocardium, including the best supplied left chamber by radiopharmaceuticals, which is enriched proportionally with the blood supply in organs, so the absorption of pharmaceuticals in the lowered blood supplied areas (ischemic or necrotized) of the myocardial regions is lowered in comparison with the normal regions. The functional test detects the myocardial ischemia. The blood supply of the normally supplied left chamber is increased by 3-4 times due to physical or medication loading, while the blood supply of the regions supplied by the more than 50% constricted vessels, is increased only slightly. The aim is to differentiate the scar tissue and the serious inactive ischemia by the inactive myocardial scintigraphy, which is indicated as a lack of regional activity or as a significantly reduced activity.

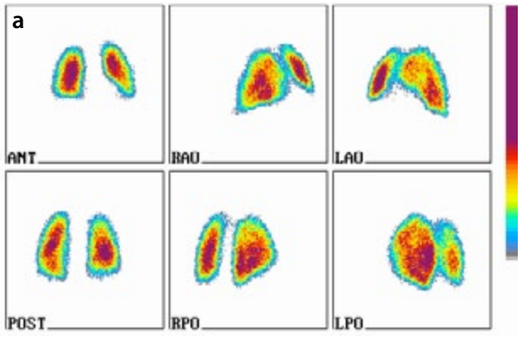


Figure 2. a Negative lung scintigraphy

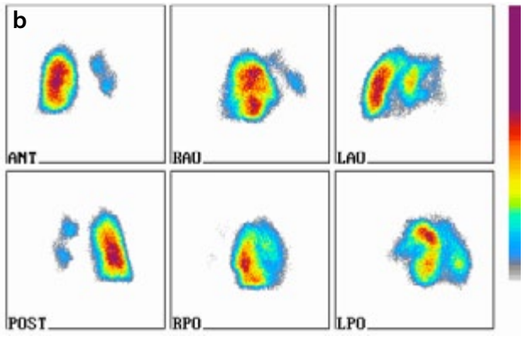
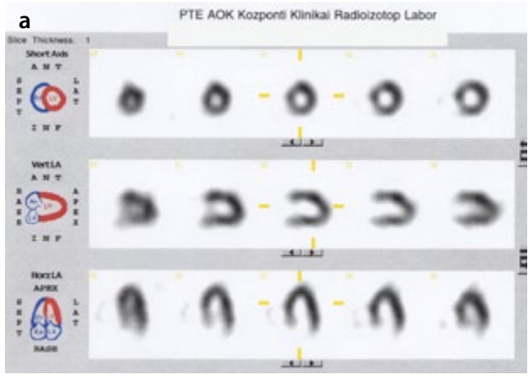


Figure 2. b Perfusion defects in the left lung



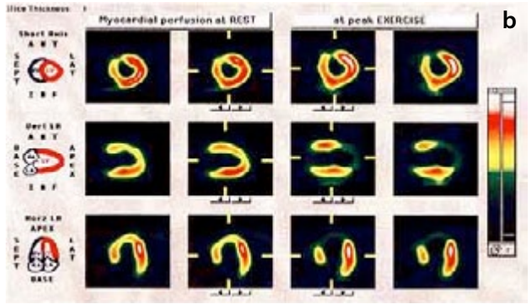


Figure 3. a: Normal left chamber perfusion (SPECT Imaging)
Figure 3. b: anterior perfusion defect (SPECT)

Indications:

- The diagnosis of ischemic cardiac disease (the expansion of ischemia, its severity, its localization)
- risk assessment (severity of ischemic cardiac disease, the assessment of the patient's life expectancy)
- the assessment of efficiency of revascularization (coronarography, after PTCA)
- examination of vitality: after myocardial infarct to decide if the revascularization is necessary, in case of functional damage of global or regional left chamber

Patient preparation: patient must be informed about the risks of functional test, its potential prevention. In order to obtain a good quality image, in case of examination by T1-201, the patient must have an empty stomach. At ergometric functional test the suspension of beta blockers is required for at least 24 hours. In case of functional medication (Dipiridamol) food and medication containing theophylline and caffeine must be avoided for 12 hours.

Administration of long lasting nitrate should be avoided. After the administration of radiopharmaceuticals, food containing fat (milk, chocolate), fibre liquid can be consumed in order to contract gall bladder and accelerate the advance of the radiopharmaceuticals through the intestinal tract.

Brain perfusion examination

The most often applied radiopharmaceutical for the examination of brain blood flow is HPA labelled by 99mTc . The molecule is a lipophile, so it can easily enter the intact blood brain barrier, so it is distributed in the brain tissue proportionally with brain perfusion, after

the lipophile-hydrophile change, it remains stabile for hours, no redistribution occurs.

Indications:

- acute and chronic cerebrovascular diseases
- it can provide valuable information about complications, consequences and it can facilitate the choice of treatment strategy in acute stroke.
- the estimation of functional reserve capacity in chronic cerebrovascular disease can help to decide the necessity of vascular surgery
- the determination of epileptic focus before operation (maybe by ictal examination, performed during epileptic fit)
- suspected dementia
- traumatic cerebral injury

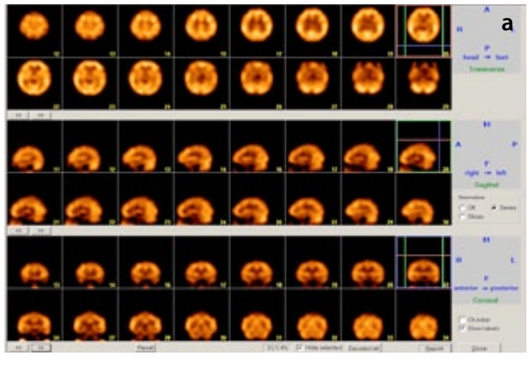


Figure 4. a: negative brain perfusion test (SPECT imaging)

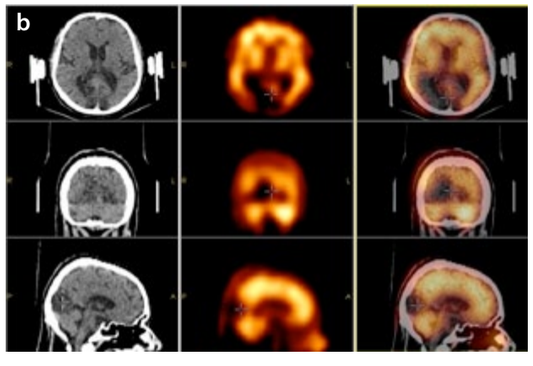


Figure 4. b: Occipital perfusion defect SPECT/CT imaging

- inflammatory cerebral diseases
- determination of brain death
- Patient preparation: before the examination the patient should avoid a great amount of caffeine, coke, energy drink, alcohol intake, smoking and medication having an impact on cerebral blood flow.

Make sure that the patient is able to co-operate until the end of the examination.

Dynamic perfusion examinations

The blood flow of different organs can be well examined after administration of radiopharmaceuticals which can be discharged (emitted) from the body quickly. The examination can be performed only by computer, as images must be taken every 0.5-1 seconds for 1-2 minutes to be evaluated in quantity afterwards. In the time-activity diagram the entrance time, maximal activity time(T maximum), at the descending branch of the diagram, half-life time, the time of 50% reaching the maximum(T ½) can be calculated, by this the dynamics of perfusion can be characterized.

Indications:

- study of the lung and heart circulation, calculation of circulation time in case of right, left heart diseases ("first passage " examination), localization of left-right shunt, its detection and its quantification
- kidney perfusion, in suspected renal hypertension, for the examination of the renal lesion between the two sides
- three phase bone scintigraphy for examinations of acute and chronic osteomyelitis, primary and secondary bone tumours

Patient preparation: vein in good condition, preferably, cubital vein is necessary for administration in bolus. Congestion happens by pumping the tonometer to about 100 mmHg.

Examinations founded on labelling of the heart blood content

In certain diseases the blood content of the organs alter, either increases or decreases, so the given lesion can be detected on the basis of the alteration of the blood content.

ECG portal left chamber parietal and ejection fraction examination

Basic principle: the Tc-99m-pyrophosphat bonds to its own RBCs, after its continuous distribution in the blood content that is the imaging takes place in equilibrium, placing the sensors of the ECG device on the patient. The time of ECG R wave is fixed by the computer, it makes synchronized imaging possible (gated studies). Computer data storage produces a virtual cardiac cycle consisting of 16 or 32 images by averaging several hundreds of cardiac cycles.

The determination of global and regional ejection fraction, virtual imaging of certain parameters (the amplitude, phase of movement) can be calculated and detected by end-diastolic and end-systolic images in LAO 30 view. The examination is

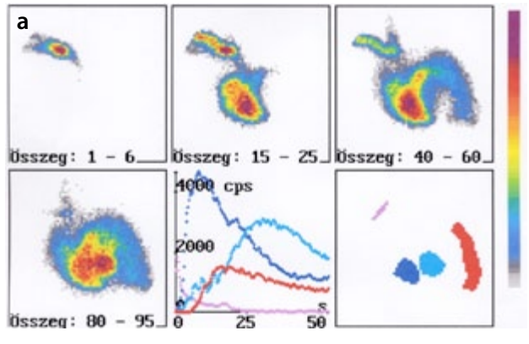


Figure 5. a: heart 'first passage' exam

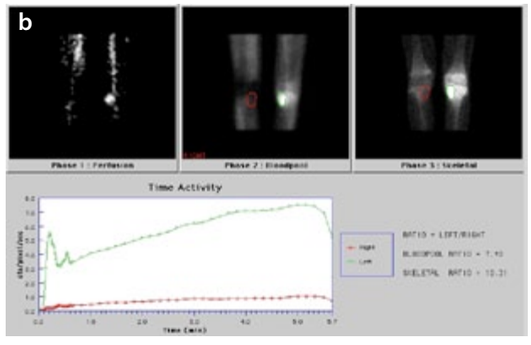


Figure 5. b: 3-phase bone scintigraphy

Table 3. A vértartalom jelölésén alapuló vizsgálatok

Pharmaceuticals	Isotope	Dose	Examined organ	The name of examination
own RBCs	Tc-99m	600 MBq	blood content of heart	ECG portal left chamber parietal movement and ejection fraction
own RBCs	Tc-99m	600 MBq	blood content of liver	blood content of liver

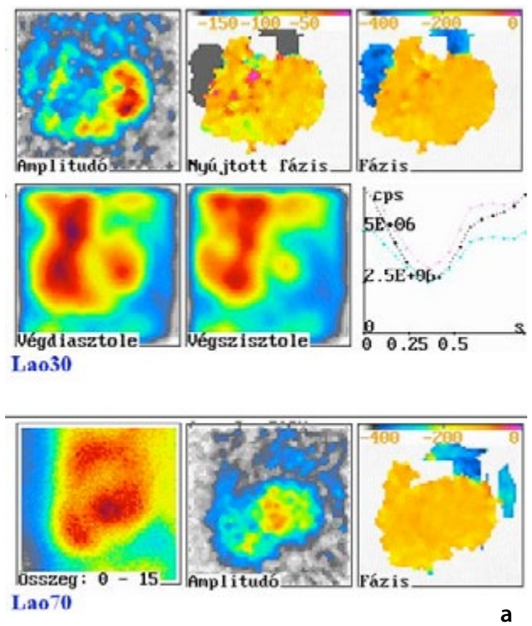


Figure 6. a: normal left ventricular function ejection fraction: 64.1%

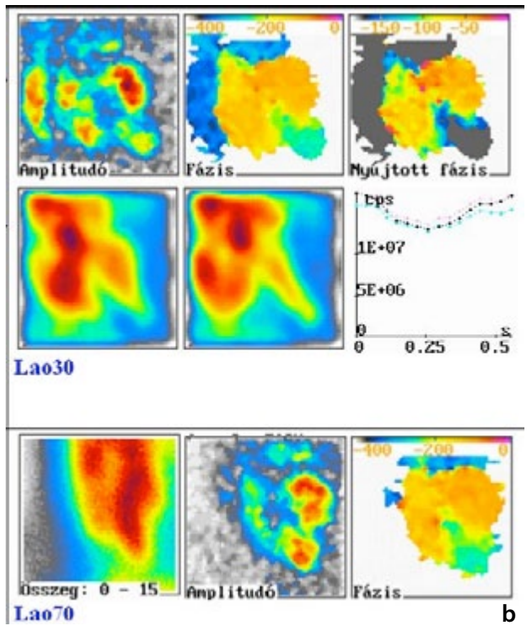


Figure 6. b: left ventricular apex paradox pulsation ejection fraction: 25.1 %, constricted

performed to determine heart wall disorders in LAO 70 view, as well. The examination can be performed in rest ('resting' ECG), during exercise or medication.

Indications:

- evaluation of left chamber function in rest or during exercise
- evaluation of prognosis after acute myocardial infarction, before planning of therapeutic treatment
- determination of left chamber capacity in case of chronic ischemic heart disease
- before and during administration of cardio-toxic medication (doxorubicin)
- in case of myocarditis, dilated or hypertrophic cardiomyopathy
- left and right ventricular volume and ejection fraction in cardiac valve disease
- after heart transplantation evaluation of left chamber function, recognition and monitoring of rejection

Patient preparation: the contra-indication of examination is arrhythmic heart function, so it is important to restore and sustain sinus rhythm as far as possible.
liver blood content scintigraphy

Basic principle: the patient's activity of 99mTc-labelled red blood cells within liver, that is the blood content of expansion process in liver, is examined.

Activity content of cavernous haemangioma is increased progressively, it is bigger in later pictures than earlier. Evaluation takes place in comparison with focal parenchyma defect detected by colloidal liver scintigraphy.

Indications:

- confirmation or exclusion of expansion process in the liver detected by radiological imaging modality
- differentiation between primary liver tumour, metastasis, cyst, FNH (its importance is decreasing by the spread of UH, CT, MRI)

Patient preparation: it is not necessary. Take care of medication affecting red blood cell labelling.

Examinations by radiopharmaceuticals concentrated in the cells of parenchyma

Certain diseases destroy parenchyma cells within the organ, so the activity of radiopharmaceuticals, concentrated in them, is lower in the localization of the disorder (negative scintigraphy).

Basic principle: it is a simple examination technique for evaluation of the function and morphology (shape, size, location, function of felt nodules of thyroid) of thyroid, based on the

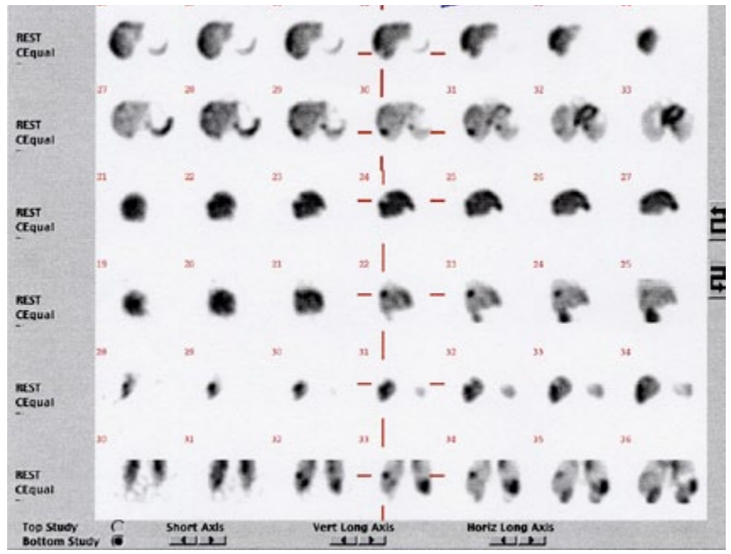


Figure 7: colloidal liver scintigraphy *(upper segment lines)* and liver blood content *(lower segment lines)* comparison of SPECT examination in case of haemangioma

so called 'trapped' phenomenon (active transport into the acinar cells of the thyroid). 20 minutes after the administration of radiopharmaceuticals IV a picture is taken of the neck from anterior direction, completed by SPECT/CT imaging, if it is necessary.

Indications:

- the detection of the character thyroid nodules, cold, warm, or hot nodules
- detecting thyroid tissue located abnormally
- differential diagnosis of hyperthyreosis

Patient preparation:

- If the examination is only aimed at preparing a scintigram, medication for hyperfunction of the thyroid should not be suspended (propylthiouracyl, methimasol)
- if storage of iodine or 99mTc-pertechnetate and scintigram are carried out at the same time, medication of hormone synthesis inhibitors must be suspended
- administration of thyroid hormones must be suspended before scintigraphy and storage, the thyroxine (T4) 4 weeks before, triiodinethyronin (T3) 2 weeks before the examination
- medication and medical preparations, food containing iodine in big quantity should be avoided,
- there are some diagnostic substances (e.g. lymphographyic contrast substance (amiodarone), which are retained in the body for long months and make the evaluation of the scintigram and its storage impossible.

Colloidal liver-, spleen scintigraphy

Basic principle: 99mTc-labeled radiocolloids administered IV, through quick phagocytosis get into the reticuloendothelial

Table 4. Szcintigráfia a parenchymasejteket károsító betegségekben

Pharmaceuticals	Isotope	Dose	Examined organ	The name of examination
pertechnetate	Tc-99m	37–74 MBq	thyroid nodules	thyroid scintigraphy
colloids	Tc-99m	150–200 MBq	liver, spleen RES cells	liver-,spleen scintigraphy
iminodiacetic acid (HIDA)	T-99m	150–200 MBq	liver poligonal cells	hepatobiliaric scintigraphy
dimercapto-succinic acid(DMSA)	Tc-99m	150–200 MBq	kidney tubular cells	kidney scintigraphy
diehyilene-triaminepenta-acetic acid (DTPA) mercapto acetyl triglyicine (MAG3)	Tc-99m	400 MBq 200 MBq	kidney glomerular cells kidney tubular cells	kidney perfusion and camera renography

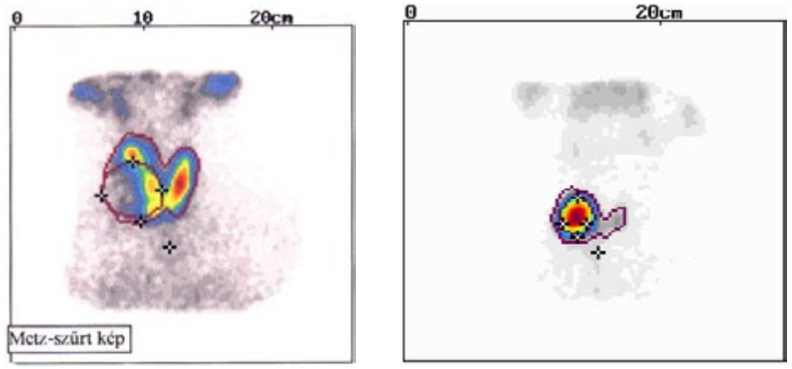


Figure 8. a: thyroid cold nodule
8. b: thyroid hot nodule

(RES) cells (liver, spleen, bone marrow), so liver-spleen scintigraphy can be performed.

Indications:

- intrahepatic expansion processes (primary liver tumour, metastasis, cyst, haemangioma)
- suspected focal nodular hyperplasia (FNH)
- parenchyma liver diseases
- detection of portosystemic shunt formation, the evaluation of its expansion, the determination of progression by repeated examination
- functional spleen examination
- detection of accessory spleen

Patient preparation: No special preparation is required and the patient does not require to be nil by mouth beforehand

Hepatobiliary scintigraphy

Basic principle: the diverse derivatives of iminodiacetic acid (IDA) are excreted by hepatocytes in a similar way, like bilirubin, so they get into bile ducts then into the duodenum and the intestinal. The bile secretion function of the liver, effusion of bile can be examined by this non-invasive technique. The patient is made to drink Sorbitol during the examination for detecting the contraction of gall bladder. The parameters (T max, T ½), of the dynamics of different liver portions, the ejection fraction of gall bladder, its emptying (discharge) speed can be calculated on the basis of the time- activity graph.

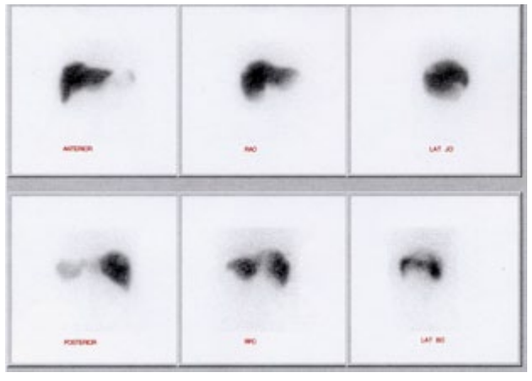


Figure 9.: focal parenchyma defect in the right upper lobe

Indications:

- detection of bile effusion obstruction and its differentiation in case of patients with cholecystitis
- tracing the penetrability of biliodigestive anastomosis
- suspected acute cholecystitis
- examination of gall bladder function in case of chronic cholecystitis
- examination of contractility of gall bladder prior to gallstone crushing
- examination of gallbladder dyskinesia
- detection of gall effusion, gall fistula
- examination of gall reflux (duedenogastric, gastroesopghageal gall reflux)
- examination of gall duct developmental abnormalities (Caroli's disease, choledochus cyst)
- differential diagnostics of jaundice of the newborn
- examination of transplanted liver (complications: rejection, bile flow, obstruction)
- examination of focal nodular hyperplasia (FNH)- (on the basis of specific protocol)

Patient preparation: 4-hour fasting prior to examination, it is performed with empty stomach of the patient. Gall bladder often cannot be filled after more than 24-hour fasting or in case of artificial nutrition, so sincalide (CCK-analogue) preparation is necessary to avoid false positive result of " the non-saturated gall bladder".

Kidney scintigraphy

Basic principle: dimercaptosuccinic acid (DMSA) is concentrated in the tubular cells of the kidney, so it is a molecule suitable for detection of kidney parenchyma. The main target of scintigraphy is the detection of pathogenic abnormalities, due to urethral infections, in the renal cortex.

The lesions detected by scintigraphy are not specific because similar lesions can be detected in case of abscess, cyst, double kidney, hydronephrosis, as well: with the help of combining ultrasound and DMSA scintigraphy differentiation can be improved concerning the diseases. Radiopharmaceuticals can be accumulated in the cavities of kidney in case of distinct hydronephrosis, by this it makes the images of the renal cortex more difficult to evaluate.

Indications:

- detection of focal kidney parenchyma-damage
- detection of kidney damage 6 months after the acute pyelonephritis
- detection of acute pyelonephritis
- detection of congenital disorders: double kidney, small kidney, horseshoe kidney
- detection of ectopic kidney
- confirmation of kidney failure with multiple cysts
- comparison in % of the function of the two kidneys (quantitative evaluation)

Patient preparation: no need for an empty stomach. The patient's needs to be well- hydrated. 3-5dl fluid intake is necessary 1 hour prior to examination. In case of infants previous cannula insertion is necessary IV (intravenously).

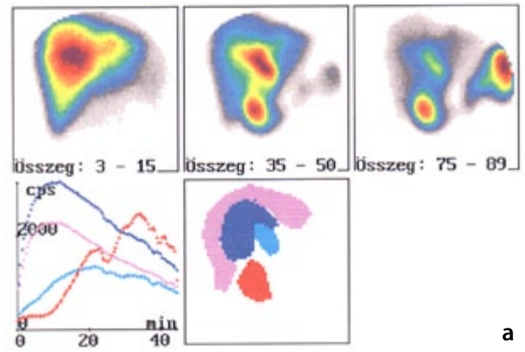


Figure 10. a normal hepatobiliary dynamics

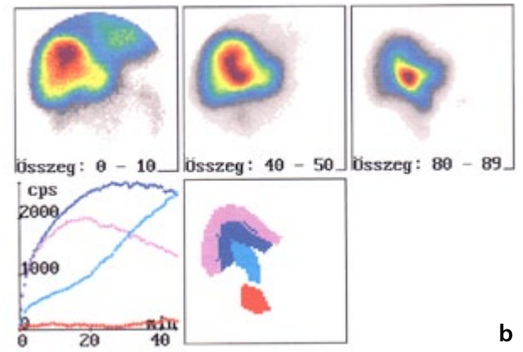


Figure 10. b papilla of vater stenosis

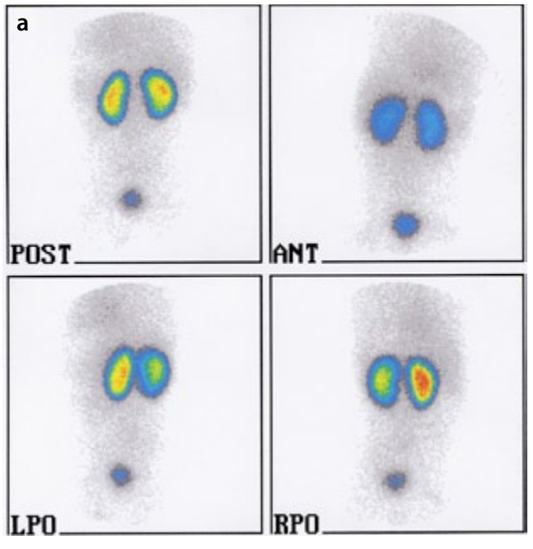
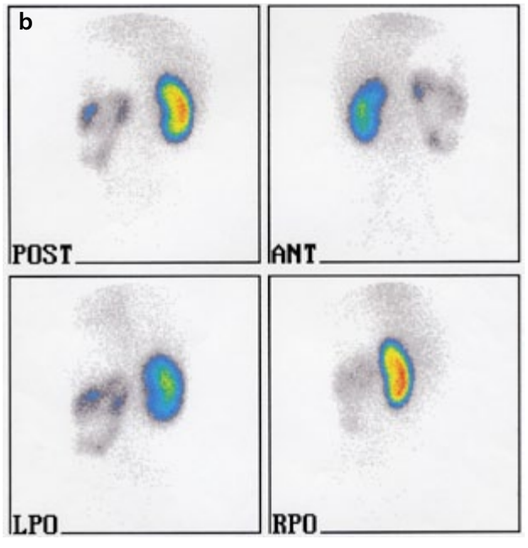


Figure 11. a: normal kidney scintigraphy



11. b. left-sided destructed kidney

Kidney perfusion and camera renography

Basic principle: Kidney function as well as excretion of radiopharmaceutical from the kidney can be examined by the help of IV administration of radiopharmaceutical, excreted through glomerular filtration (DTPA) or tubular secretion(MAG3), the dynamics of the two kidneys can be evaluated by quantitative data (T max, T ½). The diuretic examination

(Furosemid) distinguishes the functional urinary flow disorders from the organic ones.

The so called clearance examination, the glomerular filtration rate, determined on the basis of the disappearance graph of radiopharmaceutical plasma, administered IV is a sensitive indicator of the kidney function.

Indications:

- kidney parenchyma lesions, where relative functional evaluation is valuable
- suspected of renovascular hypertension
- hypertension under the age of 30 and over 55
- deterioration of function due to ACE inhibitor
- kidney injury
- evaluation of kidney function after kidney transplantation

Patient preparation: no need for the stomach to be empty. The patient's needs to be well-hydrated. 3-5 dl fluid intake 1 hour prior to examination is necessary. In case of infants and children prior cannula insertion IV is necessary, as at administration of radiopharmaceutical and diureticum you must stay immobile.

Examinations performed by radiopharmaceuticals accumulated in tumour cells

Examinations based on the distinctive features of tumour cells (superficial receptors, pathogenic hormone synthesis, augmented metabolism, augmented proliferation) for the direct detection of tumours of different types.

Thyroid iodine storage, scintigraphy, therapy of non-malignant and malignant thyroid diseases with iodine-131 isotope

Iodine-131 is gamma and beta radiating isotope. To evaluate radioiodine storage gamma radiation is used, its measurement in numbers displays the percentage of the iodine isotopes, administered in the body, can be detected in the thyroid of the patient at the time of measurement. The storage examination performed with iodine isotopes simulates iodine metabolism, iodine uptake, hormone formation, and the outlet of hormone, containing iodine, perfectly. Iodine uptake is augmented if the iodine content of the thyroid is low, e.g. in case of lack of iodine, it is augmented also if hormone formation is rapid and high in case of hyperthyreosis. The diagnostic isotope iodine uptake is decreased, iodine, if the thyroid is saturated by iodine (medication, nutrition containing iodine), furthermore if TSH, stimulating iodine uptake, is either not present or it is not biologically effective (central hypothyreosis).

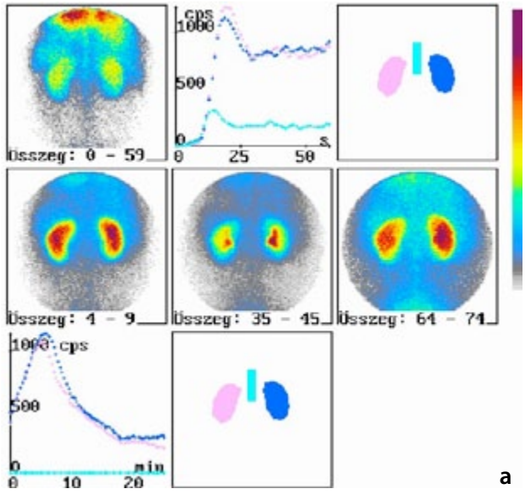


Figure 12. a: normal kidney perfusion(upper row), normal renography(middle,lower row)

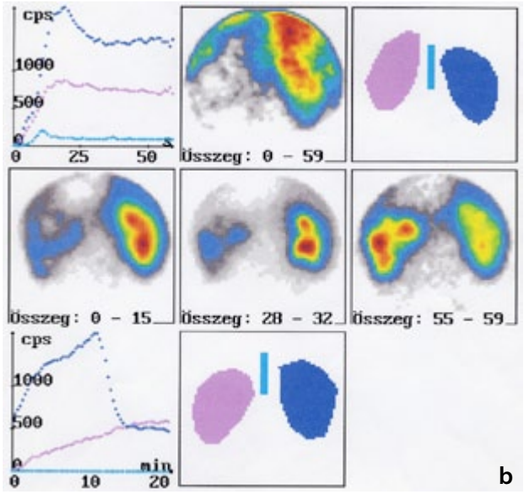


Figure12. b: left-sided decreased perfusion(upper row) right-sided functional, left-sided pielo-ureteral narrowing (middle and lower row)

Table 5. Tumor kimutatása izotópos vizsgálatokkal

Pharmaceutical	Isotope	Dose	Type of concentrating tumour	Name of examination
NaI	I-131	74 MBq (dg) 1000-3700 MBq (therapy)	differentiated thyroid cc.	pm scintigraphy + radiotherapy
diphosphonates	Tc-99m	800 MBq	bone tumour and metastasis	bone scintigraphy
metoxi-izobutil-izonitril (MIBI) tetrophosmin tallium-clorid	Tc-99m 201-Tl	600 MBq 74 MBq	parathyroid ,mamma, etc	tumour, metastasis detection
meta-jodo-benzil-guanidin (MIBG)	I-131 I-123	40 MBq 185 MBq	neuroblastoma, pheocromocitoma	adrenergic receptor
methyl-norcholesterol	I-131	40 MBq	adrenal cortex adenoma	hormonsynthesis
octreotide depreotide	In-111 Tc-99m	122 MBq 800 MBq	carcinoid, GEP tumours lung tumours	somatostatin receptor
human serum albumin (HSA)-nanocolloid	99mTc	20-60 MBq	sentinel ,lymph node	lymphoscintigraphy
fluorodeoxy-glucose (FDG)	F-18	6 MBq/kg (111-555 MBq)	diverse tumours	carbohydrate metabolism PET

Indications:

- evaluation of functional condition of the thyroid
- calculation of the necessary activity, the definition of the dose, absorbed in reality, before and after radioiodine treatment of benign and malignant thyroid diseases
- differential diagnostics of congenital hypothyreosis
- inflammatory diseases of the thyroid (thyroditis)

Patient preparation: medication containing iodine causes increased iodine saturation, by this iodine intake is impaired. Medication, containing iodine and often applied, are disinfectors (iodine tincture, Betadine), geriatric medication, expectorants, medicinal waters, multivitamins with iodine content.

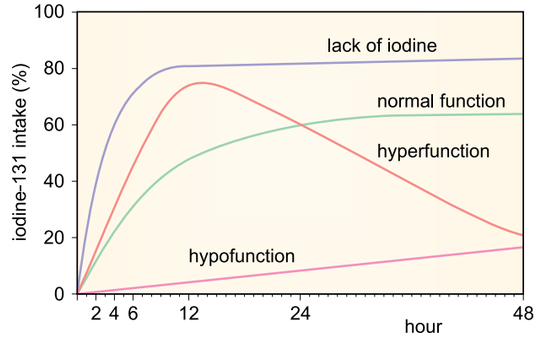


Figure 13: Iodine storage graphs

The effect of amiodarone, containing large amounts of iodine and inhibiting radioiodine uptake lasts at least for 6 months. After applying water-soluble x-ray contrast media, radioiodine storage can be performed only after 2-4 weeks. Low iodine diet is recommended prior to the examination for 7–14 days.

Inhibitors (methimasol, propylthiouracil) must be withheld for 2–4 days before examination. Administration of thyroid hormones must be suspended before the examination, L-thyroxin 4 weeks before, tri-iodine thyronin 2 weeks before the storage .An empty stomach is required for the examination. Food intake is prohibited 4 hours before taking radioiodine capsule and for an hour after it, fluid intake is allowed. Food intake can inhibit radioiodine absorption.

Thyroid scintigraphy can also be performed by 131-iodine, for this gamma radiation is used, as well. 24 hours after administration as per instructions the picture is taken, which is technically equivalent with the examination performed by 99mTc-pertechnetat (see above).

Radioiodine therapy: 131-iodine isotope beta radiation, which has 0,8 mm penetration capacity, is applied for the treatment of the thyroid diseases. The treatment means the administration of 131-I-Na- iodide capsule or fluid orally. The absorbed iodine is taken from the blood flow by the thyroid through active transport. The iodine is transmitted to the cells by the iodine pump (Na+/I-symporter). The iodine is built into the tyrosine amino acid within the cells, thus it becomes a component of the hormones of the thyroid. The therapeutic dose of 131-iodine isotope beta radiation, ad-

ministered into the thyroid, inhibits the decay of the thyroid cells, and it can cause the necrosis of thyroid cells dependent on the absorbed dosage. The target of the radiation effect in the cell is mainly the DNA, in which the damages, diverse and only partially restorable, are caused. The radioiodine treatment has irreversible effect, it is a definitive therapy. It is suitable for treating both benign and malignant thyroid diseases

Indications:

- hyperthyreosis (Basedow's disease, nodular struma, autonomous adenoma)
- differentiated thyroid cancers (papillary, follicular carcinoma)
- metastasis, taking iodine
- After radiotherapy, using 131-iodine gamma radiation, whole- body imaging and complementary SPECT or SPECT/CT examination can be performed, for the detection of iodine distribution or of residual thyroid tissue, concentrating iodine, and distal metastases

Patient preparation: FT4, FT3 level must be reduced to normal domain, preferably, by inhibitor before the treatment of benign thyroid diseases. TSH can remain suppressed. Methimasol or propylthiouracil must be withheld 2-3 days before radioiodine treatment. If it is necessary, two weeks after radioiodine therapy, inhibitor can be administered again until the effect of radioiodine is realized. Exposure to iodine should be avoided (see above).

Low iodine diet is recommended prior to the treatment for 2 weeks.

Administration of rhTSH (recombinant human TSH) in case of nodular struma increases radioiodine uptake. Cardiac insufficiency and arrhythmia must be treated. Contraception is also necessary.

When treating thyroid cancer, TSH stimulates the uptake of the thyroid radioiodine, so before radioiodine treatment TSH level must be increased by suspending thyroid hormone replacement for a certain time, (1) or administration of rhTSH (2) 1-4 weeks before suspension of L-thyroxin, then administration of 3x20 ug triiodine thyronin daily for 2 weeks, then suspension of triiodine thyronin 2 weeks before treatment.

If the patient remains on continuous L-thyroxin hormone replacement, then 1-1 ampulla (0,9 mg) rhTSH must be administered on 2 subsequent days before the treatment. Exposure to iodine must be avoided. The patient's blood test should be normal (in order). Pregnancy is contraindicated.

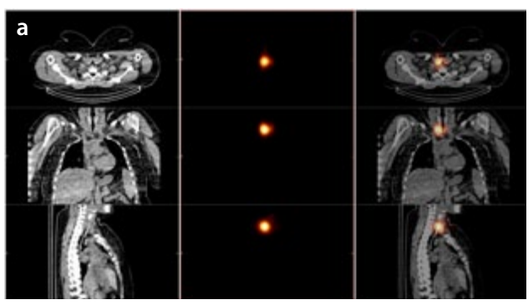


Figure 14. a: the rest of thyroid after big dosage of radioiodine therapy(SPECT/CT)

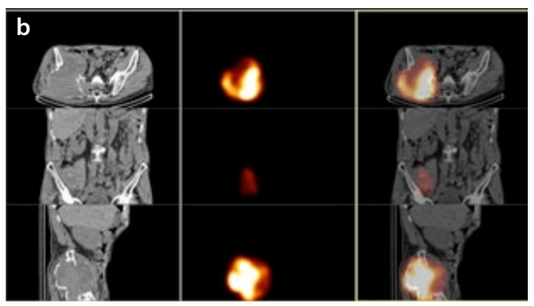


Figure 14. b: metastasis taking iodine in the left pelvis (SPECT/CT)

Bone scintigraphy

Basic principle: 99mTc labelled phosphate analogues are used for the examination, as they bind well to the bone and they show rapid clearance from the soft tissues. By the help of them the circumscribed or diffuse intensity of the metabolism of the bone system can be examined. Bone scintigraphy is a very sensitive technique regarding the detection of bone diseases, which facilitates to establish the diagnosis 6 months earlier than the traditional radiological methods and/or detects more lesions. The primary tumours of bones are relatively rare in adults but the bone metastases are common (breast, prostate, lung, head-neck cancer etc.).The most modern imaging technique is the whole-body bone scintigraphy (the planar pictures of the whole skeleton in anterior and posterior view). The SPECT or SPECT/CT examination provides the tomographic picture of a particular region of the bone system. SPECT method has more specific diagnostic value than the planar examination, its use is indicated in case of diagnostic insecurity. Multi phase bone scintigraphy (perfusion and blood content examination) can be useful for the detection of bone tumours and inflammations (see perfusion examinations)

Indications:

- primary tumours (e.g. Ewing sarcoma, osteosarcoma)
- secondary tumours (metastases)
- osteomyelitis-
- Perthes disease, avascular necrosis

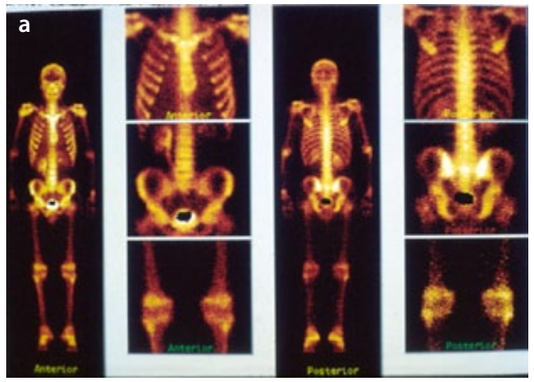


Figure 15. a: negative bone scintigraphy

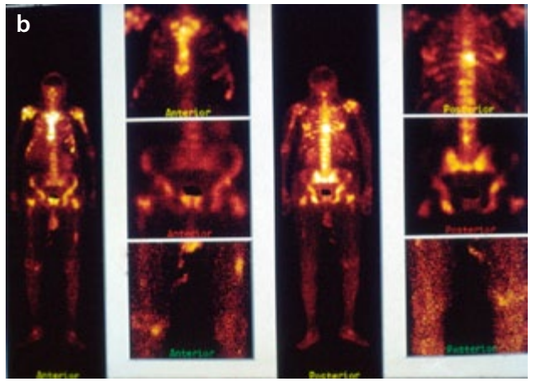


Figure 15. b: multifocal pathological concentration

- metabolic disorders (Paget osteoporosis)
- loosening or infection of denture
- evaluation of osteoblastic activity prior to radiotherapy

Patient preparation: is not necessary. After administering injection at least 1l fluid intake is required to reduce background activity. Bladder must be emptied right before the examination.

Nonspecific radiopharmaceutical concentration in diverse tumorous tissues

99mTc-MIBI and 99mTc-Tetrofosmin are the small cation complexes of technetium, which accumulate in heart muscles and diverse tumours. Uptake is connected with the elevated metabolism and proliferation of cells. The methoxy-isobutyl-isonitrile (MIBI) and tetrofosmin are concentrated in the mitochondria of proliferative tissues. 201-tallium-chlorid, applied for detection of tumours, can get into the cells by Na-K pump. On the basis of this all three radiopharmaceuticals are suitable, on the one hand for myocardium /see myocardial perfusion examination), on the other hand for the examination of actively growing tumorous tissues. The two common application fields are the nonspecific detection of parathyroid adenomas and mamma tumours.

Parathyroid scintigraphy

Basic principle: the specific feature of hyperparathyreosis is the stimulated production of the parathyroid hormone (parathormone). The overproduction of parathormone increases the ionised calcium level of the serum and decreases the phosphor level, increases the amount of calcium, emptied by urine. Hyperparathyreosis can be primary or secondary, in the majority of cases adenoma. Hyperparathyreosis is often free from symptoms and only the elevated serum calcium directs attention to it. Detection takes place by subtraction method: 99mTc-MIBI is concentrated in both the thyroid and parathyroid adenoma, however, 999mTc-pertechnetat is concentrated only the thyroid tissue (see thyroid scintigraphy). After the subtraction of the two digital pictures, the hyperfunctioning parathyroid tissue can be distinguished, the detection of which can be facilitated by the use of intraoperative gamma probe during the operation (see sentinel lymph nodule examinations). The detection of small sized adenomas or ectopic adenomas by SPECT/CT can be more efficient.

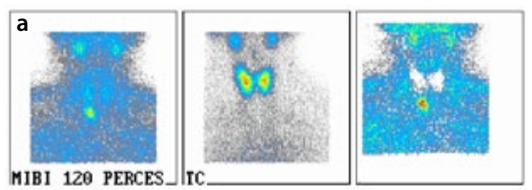
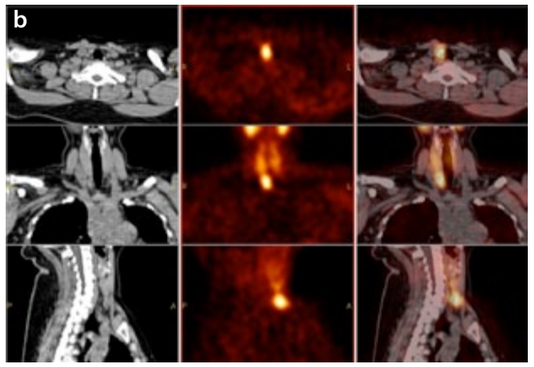


Figure 16. a: right-sided mpm adenoma (subtraction picture)
Figure16. b: right-sided mpm adenoma (SPEC/CT)



Indications:

- the localization of hyperfunctioning parathyroid tissue before operation
- the localization of hyperfunctioning parathyroid in persistent or recurrent cases
- localization of ectopic parathyroid adenoma

Patient preparation: in case of subtraction method, the administration of thyroid hormones must be discontinued at least 1 month earlier to ensure the sufficient isotope uptake of the thyroid, exposure to iodine must be avoided (you must wait after administration of contrast agents 1 month, after suspension of amiodarone 1 year). Make sure that the patient is placed in the same position during thyroid and parathyroid scintigraphy.

Scintimammography

Basic principle: scintimammography is a non-invasive method, which provides general information about the vitality of tumour and protoplasm. Diverse radioactive tracers can be used for this method (see above). Besides them, 99mTc-is recommended for the detection of breast cancer, to complement bone scintigraphy in all cases. Radiopharmaceuticals are concentrated in the axillary lymph nodes besides the lesion in the mamma.

Indications:

- detection of mammary carcinoma, if mammography is insecure
- suspicious microcalcification, or parenchyma lesion after operation or biopsy
- breast scar tissue, in case of solid breast tissue by mammographic examination
- complementary method for individuals with implant
- detection of multicentral, multifocal or bilateral existence of cancer
- judgement and prediction of tumour response in chemotherapy treatment.

Patient preparation: examination does require any special preparation.

Adrenergic receptor examination

Basic principle: tissues manufacturing catecholamine and adrenergic receptors of tumours bind to noradrenalin analogue meta-iodo-benzyl-guanidine (MIBG) specifically. The compound labelled by 131-I or 123-I- detects the tumours rich in catecholamine (adrenal medulla) or the organs (heart) with rich adrenergic innervations.

Indications:

- neuroblastoma (the third most common solid tumour in childhood)
- pheochromocytoma (adrenal medulla tumour, primarily in multiplex or malignant form)
- before large doses of 131I-MIBG radiotherapy of neuroblastoma, malignant pheochromocytoma, carcinoid, medullar thyroid carcinoma to evaluate the intensity of binding.

Patient preparation: blocking of thyroid is necessary as iodine isotopes are concentrated there. In an adult 3x30 drops of Lugol's solution for three days before administration (3x1 drop in infants, in childhood the dose increases in comparison with the age of the child) The alpha-blockers, labetalol, Ca-antagonists, tricyclic antidepressants, sympathomimetic drugs (e.g. ephedrine) must be discontinued before the examination.

Adrenal cortex scintigraphy

Basic principle: adrenal cortex manufactures mineralocorticoids, glucocorticoids and androgenic hormones. The initiating substrate is the cholesterol. One week after the administration of the radioactive labelled 131 I-methyl norcholesterol intravenously, both normal adrenal cortex can be detected

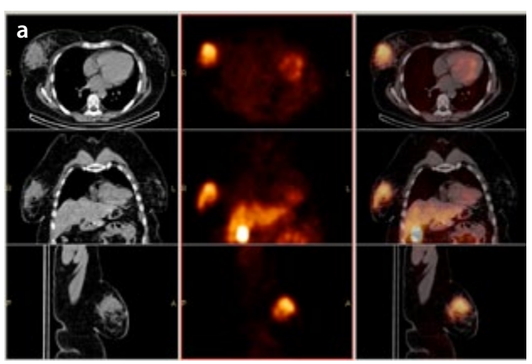


Figure 17. a: MIBI concentration in mamma tumour (SPECT/CT)

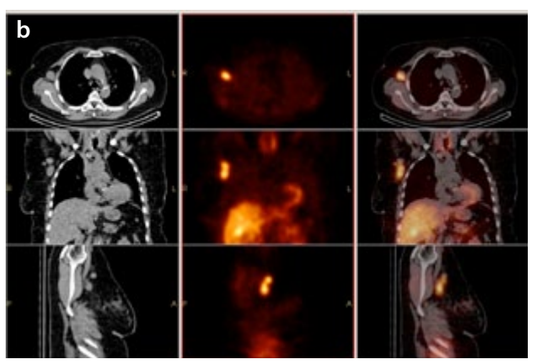


Figure 17. b: MIBI concentration in the lymph nodes (SPECT/CT)

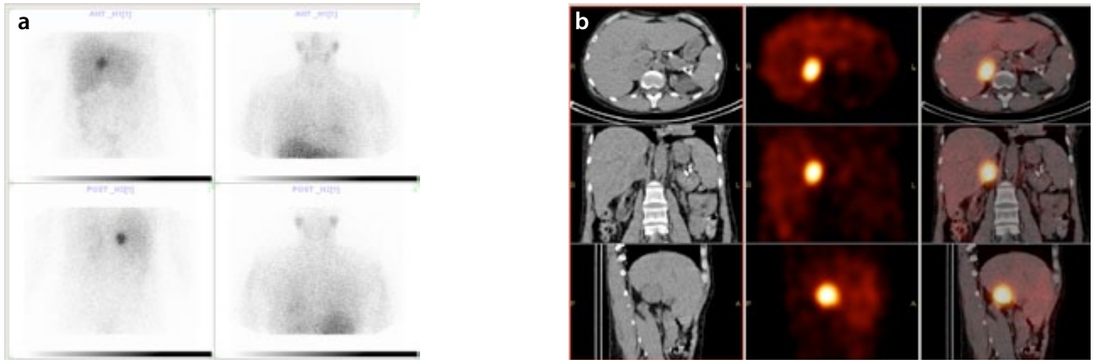


Figure 18: right sided pheochromocytoma (a: static pictures, b: SPECT/CT pictures)

in the scintigraphy picture. The hyperfunctioning lesion, adenoma or hyperplasia occurs earlier or with more intensive activity in the pictures. The malignant adrenal cortex carcinoma generally hardly or does not take up any radiocholesterol at all. The unilateral elevated production of glucocorticoid is accompanied with the endogenous suppression of the antagonist side. Some tumours /aldosterone hyperfunction, hyperandrogenism/ do not cause decreased uptake of the antagonistic adrenal cortex activity, examination is performed in corticosteroid suppression per os (e.g. Oradexon, Medrol).

This time the normal cortex does not take up the radiopharmaceutical, however, the pathological hormone production cannot be suppressed.

Indications:

- If there is unilateral adenoma or bilateral hyperplasia behind Cushing syndrome
- If there is aldosteronoma or bilateral hyperplasia behind Conn syndrome
- the localization of functioning formation in diseases, accompanied with excessive sex hormones
- detection of residual cortex tissue after operation or recurrence
- detection of incidentaloma

Patient preparation: the radiopharmaceutical labelled with iodine-131, so it is equivalent with the necessary preparation for131-I-MIBG (see above)

Somatostatin receptor scintigraphy

Basic principle: somatostatin is a small, cyclic neuropeptide, which can be found in both in nerve cells (neurocytes) and in endocrine cells, it can be found in great density in the brain, peripheral neurons, in the endocrine cells of the pancreas and in the intestinal tract of stomach. The 111In-octerotid binds to somatostatin receptors specifically, with greatest affinity to the subtype receptor 2. The depreotide molecule can be

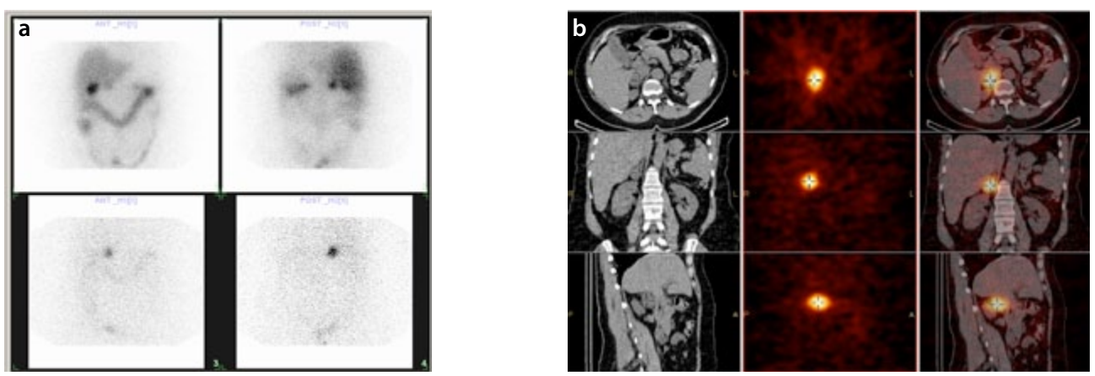


Figure 19: right-sided adrenal cortex adenoma (a: static pictures, b: SPECT/CT pictures)

labelled by 99mTc, this radiopharmaceutical binds to the subtype receptors 2, 3, 5.

The greatest amount of somatostatin receptors can be found in neuroendocrine cells, but it can occur in cell groups of other origin, thus these also can be viewed in the scintigraphy pictures.

Indications:

- neuroendocrine tumours
- tumours of sympathoadrenal system (pheochromocytoma, neuroblastoma)
- ganglioneurona,paraganglioma
- gastroenteropancreatic tumours (GEP), carcinoid gastrinoma, insulinoma, glucagonoma, Vipoma etc.
- medullar thyroid carcinoma
- small cell lung cancer
- differentiated thyroid cancer
- astrocytoma, meningioma
- ophtalmopathy in thyroid disease

Patient preparation: inactive somatostatin analogue medication treatment must be suspended before the examination (provided it is not contraindicated). Administration of medication containing molecule with short-lasting effect can be discontinued one day before the examination, the one with long-lasting effect must be suspended 3-4 weeks before the examination. About 2% of the administered radioactive agent is emptied by the liver, because of the potential artefact, the administration of an aperient cathartic orally should be asked one day before the examination and during it. Abundant fluid intake is necessary, the patient should be in a sufficiently hydrated condition one day before and after the examination

Sentinel lymph node examination

Basic principle: according to the sentinel lymph node hypothesis (SN), the released tumour cells from the primary tumour spread and reach the first draining lymph node in a predictable, determined way by the lymph flow since the flow is not accidental but directional. This node- standing at the gate of the lymph region, exposed to regional metastasis firstly- is the sentinel node. It has been proved that if the sentinel lymph node is free from metastasis, then the other lymph nodes of the identified region are also free from metastasis- with probability of 97%. If radiocolloid is injected into the tumour tissue or around it intraparenchymally , the tracer follows the same route as the released tumour cell, passing along the lymph route reaches the sentinel lymph node in which it is blocked and accumulated (concentrated)-/ macrophage cells phagocytise them./. By this the lymph node can be viewed and/or detected by a nuclear imaging technique, (measuring) equipment. The axillary block dissection and its complications due to the detailed histological examination after the surgery removal (by the application of the gamma, intraoperative probe which is very susceptible to gamma radiation) of the identified sentinel lymph node this way-can be avoided, the patient's quality of life will be significantly better.

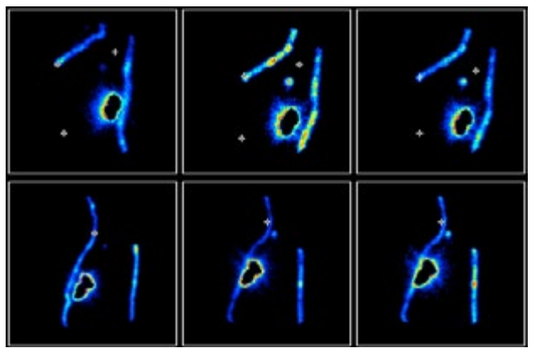


Figure 21: the sentinel lymph node of the mamma tumour in the axillary region (upper row: 1, 3, 24 hour anterior pictures, lower row. 1, 3, 24 hour lateral pictures)

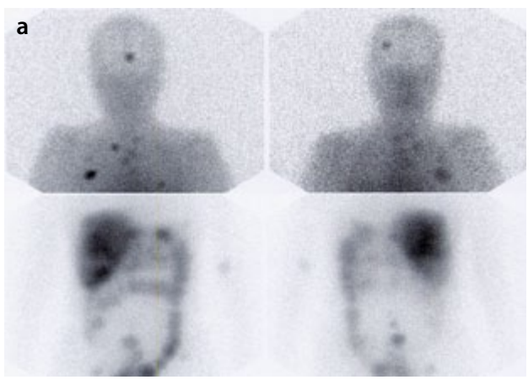


Figure 20. a: carcinoid metastases (static picture)

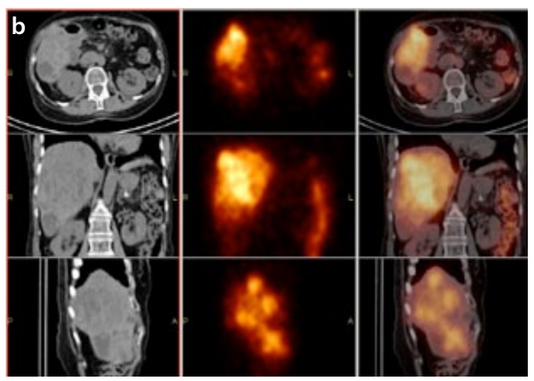


Figure 20 b: carcinoid liver metastases (SPECT/CT picture)

Indications:

- malignant breast tumour (<.4cm, one focal,N0 stage)
- melanoma malignum (1–4 mm thick, N0 stage)
- vulva carcinoma, melanoma
- penis carcinoma

Patient preparation: no special preparation is necessary. The patient should be informed in details about the procedure of the examination.

The FDG examination of tumours with tomography emitting positron

Basic principle: PET is a non-invasive diagnostic device, which gives tomographic images, and quantitative parameters concerning the perfusion of tissues, the vitality of cells, proliferation, and/or metabolic activity of tissues. For this imaging modality, substances having diverse biological features (glucose, amino acids, metabolic precursors, hormones) are used and they are tagged (labelled) by radioactive isotopes (PET radioactive isotopes) emitting positrons .The 18F-FDG is a glucose analog which can already get into the living cells in the first period of the normal glucose uptake and decay process. It is used as a tracer in cancer diagnostics because tumour cells have an elevated (high) glycolytic activity. The 18F-FDG gets into the tumorous cells because of its high glycolytic activity and it is emptied from the body through the kidney which is not able to reabsorb this tracer. 50-60 minute waiting time between the administration of 18F-FDG and scanning images, is generally sufficient to reach good tumour/ background rate of the tracer. Cell lesions connected with tumour transformation are accompanied with functional damages which can be observed before the appearance of structural lesions. Thus this way, the 18F-FDG PET is able to detect the presence of tumour even at that time when the conventional morphological imaging modalities (X-ray, CT, MRI and ultrasound) are not able to detect apparent lesions yet. The uptake of 18F-FDG into the tumour is connected with growth and vitality of tumour. So the quantitative analysis of metabolism by the help of PET scan can provide useful information about the distinctive features of the tumour, the Patient's prognosis, the response to the anticancer treatment can be monitored. At present we possess enough evidence to prove that the application of 18F-FDG-PET should become more wide-spread in the diagnostic examination of patients suspected of malignant tumours, in the stage classification of tumours and in monitoring the treatment.

Indications:

- diagnosis of malignant process
- assessment of expansion of the disease (staging/restaging)
- patient examination, when there are biochemical evidences of the recurrence (elevated tumour marker level), however, the disease has no clinical symptom that is no evidence which can be detected by morphological imaging modalities
- detection of recurrent or residual malignant disease
- the examination of the patient with metastasis in whom the location of the primary tumour is not known (identified)
- the assessment of the most aggressive part of the tumour for planning the biopsy
- the evaluation of the tumour response to the chemotherapy or radiation therapy
- planning of the radio therapy for both therapeutic and palliative purposes

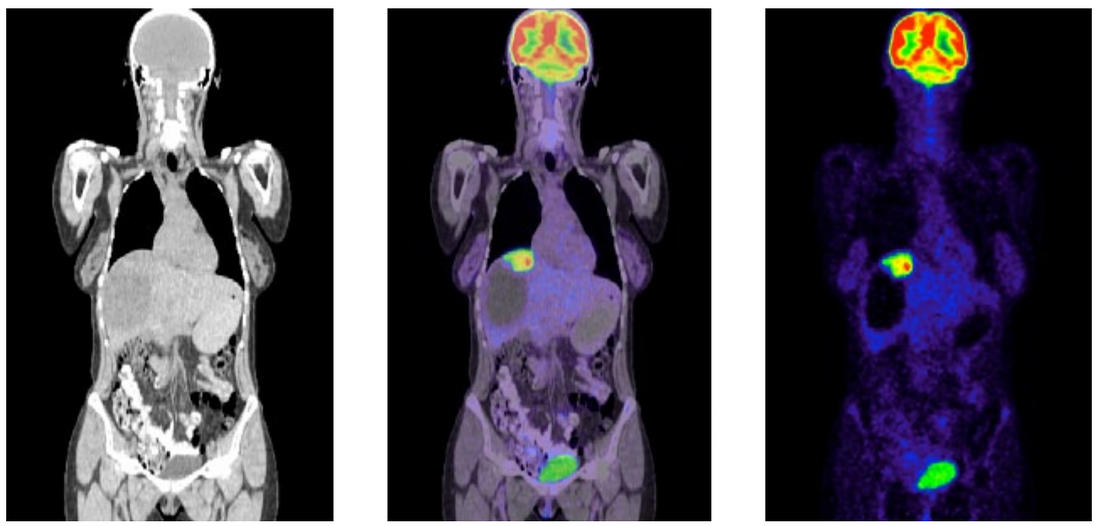


Figure 22: elevated glucose uptake of liver tumour (a: CT, b: PET/CT, c: PET picture)

Patient preparation: patients require an empty stomach 6 hours prior to examination and during this time they can have carbohydrate free fluid to ensure water intake, and to facilitate dieresis.

A képalkotó módszerek alapja

Introduction

The universe consists of two components, material and energy, in the physical sense of the word. In most physical processes there is a continuous interaction and exchange between the two, medical imaging is not an exception to the rule, either. In case of all imaging modalities, images are viewed (formed) on the basis of the interaction between the energy and tissues (material).The diverse types of energy are applied in diagnostic imaging and partially this the reason for the differences between the different methods .

Pictures can be taken of the inner structure of the human body by taking energy from a source of energy into the human body, then from the body to an appropriate detector. However, the types of energy can be diverse, however some distinctive features can regarded the same from the point of view of imaging. The essential requirement is that the energy used for imaging should penetrate the human body. In everyday life the visible light is the primary energy type which can transmit imaging information, however, it can hardly or cannot penetrate the human body, so other types of energy must be used for diagnostic imaging.

Another essential distinctive feature of imaging energy is that it should interact with the inner structure of human body in a way that it can contribute to the formation of diagnostic image. There is one common feature of all the imaging modalities, which is that most of the energy used is absorbed in the tissues. The absorbed energy is transformed into another type of energy in the human tissues, such as heat- and chemical energy. The absorbed energy this way can have undesired biological effects, which must be considered before the imaging examination. *(Figure 23)*

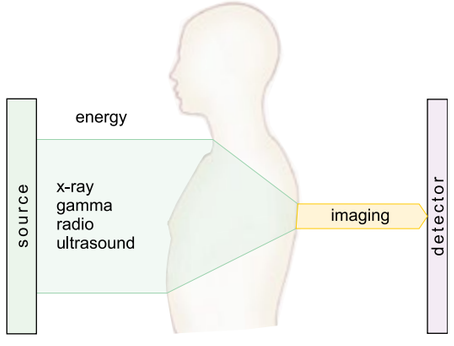


Figure 23 The basic principle of diagnostic imaging

The energies used in diagnostic imaging can be divided into two big groups:

- the types of energy whose existence is related to material
- the types of energy whose existence is not related to material

However, material is not necessary for the existence of the latter type of energy, these energies are formed in material, and energy is transmitted from one material into the other. This type of energy is radiation (X-ray, gamma, radio wave) which is the basis of all other imaging examinations except for ultrasonic. The law of the conservation of energy is true for medical imaging, as well and as it has been mentioned above, the forms of energy are transformed into each other during imaging examination.

Electromagnetic radiation

Two general forms of radiation can be differentiated: in the first form energy is packed in small units- photons-, the other type of radiation contains small particles of material, which move around through the space at great speed. The photons are energy quanta, which do not contain material. As it does not contain material, it does not have mass. This type of radiation is called electromagnetic radiation, which encompasses a large energy domain such as radio waves, light, X-ray radiation, gamma radiation.

X-ray imaging

Diagnostic imaging started with the discovery of X- radiation when X-rays were discovered by Wilhelm C. Rontgen in 1895. The discovery and the possibility of the examination of the human body and the bones spread all over the world within a few months and in the next decades several imaging modalities were born which use X-rays.

X-radiation is a form of electromagnetic radiation composed of X-ray photons. X-radiation is generated by an X-ray tube placed in the device. An X-ray tube consists of two essential parts: cathode and anode, from the former electrons are released due to electronic voltage (accelerating voltage) and start to move to the direction of anode. X-ray photons are generated when the high velocity electrons, released from the cathode, hit the target area of the anode *(Figure 23)*. So when producing X-radiation, high voltage (140kV) energy is transformed into X-radiation (actually, the efficiency of X-ray production is very low, as less than 1% of the energy is transformed into X-radiation, the rest is transformed into heat). The distinctive feature of photons is photon energy, which determines their capacity of penetrability through the tissues.

If the X-ray penetrates some material, its intensity is getting weaker continuously and this process is called attenuation. Due to attenuation the number of x-ray photons is decreased in the pencil of rays thus the intensity of radiation is decreasing continuously *(Figure 24)*.

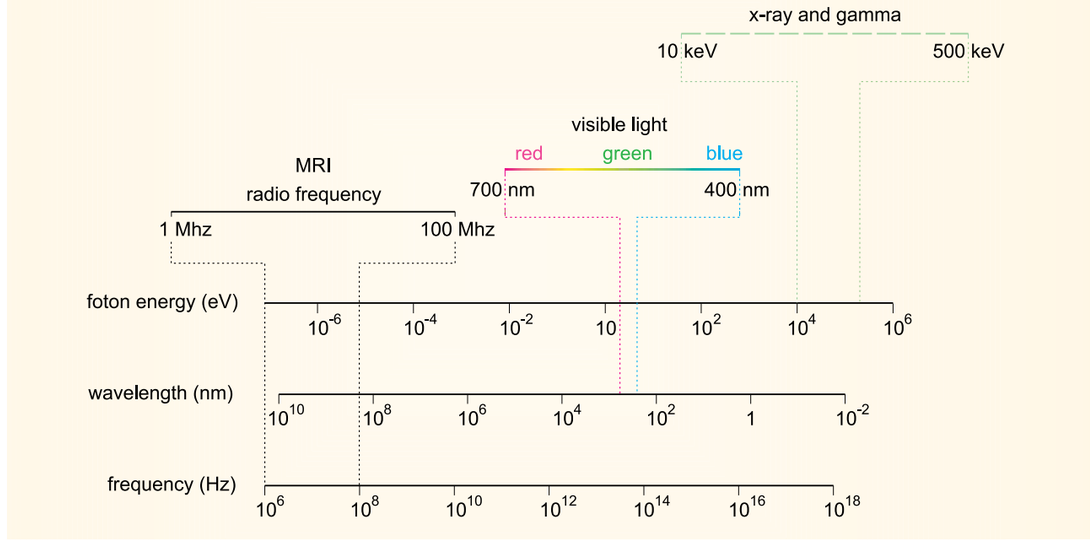


Figure 24 The spectrum of electromagnetic radiation

Attenuation originates from the interaction of X-ray photons and the material. Certain photons can penetrate (get through) the material without interaction, however, the interacting photons can interact with the whole atom, electron shell or nucleus dependent on the energy of the photon.

The most common is the interaction between shell and electrons in the field of diagnostic photon energy. In the course of shell-electron interactions two distinctive processes take place: absorption and scattering.

In the course of absorption (photoelectric absorption) X-ray photon passes its whole energy to the material in the interaction and is absorbed *(Figure 25)*. Scattering (Compton) means partial energy transfer, in the course of which the direction of X-ray photon is different from the original. *(Figure 26)* In this case the scattered photon continues its way, however at lower energy level until it gets into interaction again. One photon can take part in several interaction processes until it gets absorbed. Upon both interaction forms, free electrons are produced, which is called ionisation. Despite the relatively close absorption, this process- that is ionisation- is responsible for the harmful biological effects, caused by radiation.

The *above* mentioned rate of *two interactions* significantly determines the quality, that is the density (blackening) and

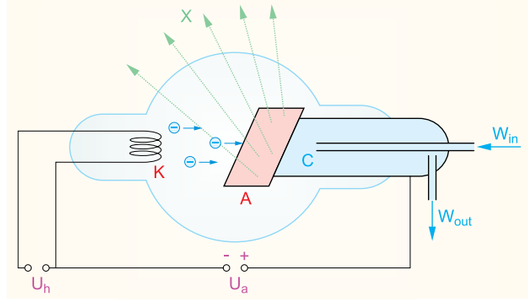


Figure 25. The formation of X-ray radiation – from the cathode (K) under high voltage current electrons hit the anode (A). In the interaction with the atoms of anode X-ray photons are created.

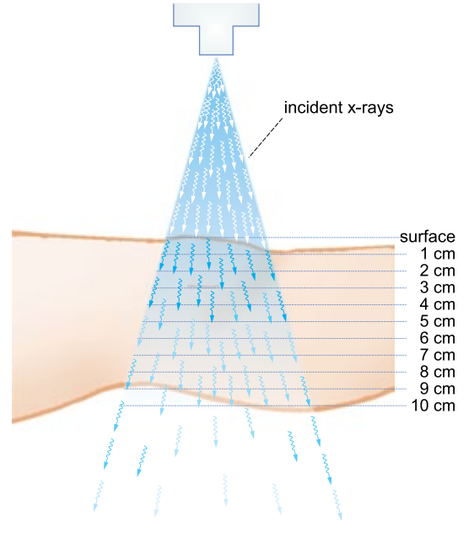


Figure 26. Radiation passes through the material

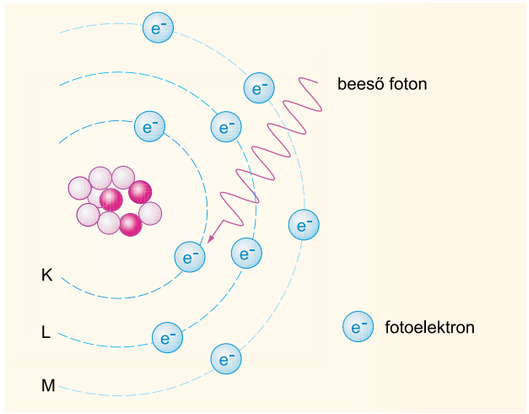


Figure 27. Photo electronic absorption – the incident X-ray photon releases an inner shell-electron that transfers its whole energy while the photon decays (http://www.youtube.com/watch?v=A-fWngXqZGA&feature=-related)

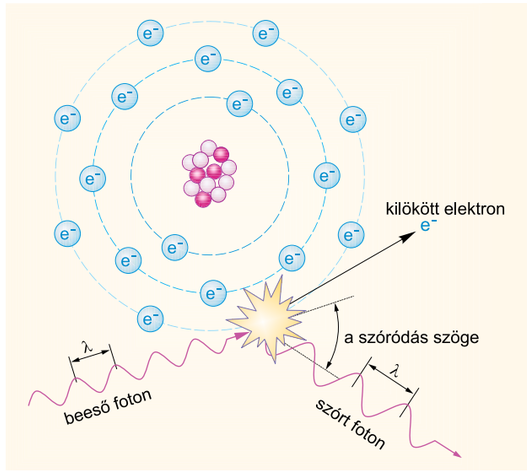


Figure 28. Compton scattering – the incident photon releases an external shell electron, transfers part of its energy, the scattered photon advances further with smaller energy . (http://www.youtube.com/watch?v=zYZNTzviBxs&NR=1)

the contrast (the number of grey shadows) of the image, which can be viewed in the X-ray picture.

Absorption can be increased by two factors: 1. low photon energy, 2. the presence of higher atomic number elements. Practically it means that lower velocity voltage can be obtained by appropriate adjustment (setting) (kV), while higher atomic number elements - besides the calcium in the bones - can get into the human body in the form of contrast media (in the form of barium and iodine). Such contrast media are widely applied for the examination of stomach-intestinal system, or that of any luminal organ like that of vascular system. Nowadays X-ray films are less often used, instead digital image stabilization is typical, the forms of which have been spread – one of them is direct digital radiography (DR), in the course of which a digital sensor absorbs the X- ray photons and converts them into electric signals. These electric signals are viewed on the monitor of the computer in the form of X-ray photos. The other possibility is the application of special phosphor plates (CR), which can store (record) the images, represented by X–ray photons, then the image from the phosphor plates are digitalized by an image receptor and viewed on the monitor by computer technology.

The great advantage of digital techniques are that the images can be evaluated later on, that is they can be modified, so the mistakes of exposure/recording can be corrected to a certain extent. Accordingly, the density (the amount of light photons leaving a unit surface) of the image, as well as the reduction or expansion of the number of grey shadows (contrast windowing) is possible.

Aspects of radiation protection – biological effect

X-ray radiation and gamma radiation (isotope diagnostics) are ionizing radiations - that is they are harmful for human body. This is why the advantages of diagnostics and treatment for the patient must be carefully considered in each case when an examination is requested or performed.

There are some cases when X-ray examination does not take place in optimal conditions meaning that it is not performed in a radiological unit at appropriate settings but e.g. in a ward. The health care workers must be aware of the most relevant aspects of radiation protection.

1. The average distance of action is determined by the same factors as it is the attenuation of radiation that is by the density of the material and the photon energy, the electric number of elements composing the penetrated material. From a practical point of view it is relevant that the low energy photons are absorbed in greater quantity in the tissues so they mean a greater risk of radiation burden than high energy photons.
2. The penetration capacity of radiation or attenuation capacity of the material can be characterized by half-value layer thickness. Half-value layer thickness is the thickness of the material at which the intensity of radiation is reduced to half. The correlation between the penetration and the number of half-value layers is exponential that is double thickness of material results in quadrupled attenuation of radiation. This principle has a great importance at the usage of devices of radiation protection.

3. At the interaction of the X-ray photon and the material scattering (Compton) radiation is produced. It means that X-ray photons do not follow the direction of the original radiation but they can follow a completely different direction. Consequently, from a radiation protection point of view, the radiated patient (the patient examined by X-ray radiation) becomes a "source of radiation". At radiation protection, primarily, protection must be directed against X-ray photons generated by scattering radiation.
4. The characteristic feature of radiation or any other type of radiation, originating from a relatively small source of radiation, is that the radiation beam is divergent from the source of radiation that is it covers bigger and bigger area dependent on the distance from the source of radiation. (Figure 3.1). At any distance from the source of radiation, the width of the area covered by the radiation is dependent on the distance from the source of radiation. Consequently, if at 1m distance the radiation beam is considered 1 unit width, then at 2m distance from the radiation source, the width of the radiation beam is 2 units but the area covered by it, changes in squares that is the area will be quadruple. Accordingly, at 3m distance the covered area will be ninefold.
   The radiation protection importance of this phenomenon is that the intensity of radiation decreases in squares, diverging from the source of radiation (Figure 2.5)
5. In the international practice of X-ray radiation imaging the so called 10 day rule is widely spread which claims that X-ray examination of abdomen and /or small pelvis can be performed only on the first 10 days of the menstrual cycle in case of women in conceptive age. By this, it can be avoided that the embryo should be exposed to ionizing radiation in case of not known gravidity. Besides this, the 28 day rule has been introduced, which restricts the performance of X-ray examination in case of cycle longer than 28 days, eliminating embryo damage. Unfortunately, in Hungary these principles are not applied consistently in everyday practice.

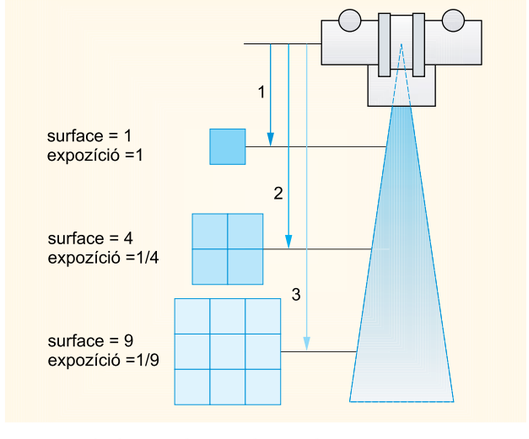


Figure 29. he law quadratic radiation decay

The types of X-ray-examinations

In the course of X-ray examinations imaging information is recorded about the whole-body volume penetrated by X-ray photons in the detector system that is the structures, in the given volume, are reflected on each other, they are summated. Consequently, the stereoscopic localization of an identified lesion cannot be evaluated on the basis of one recording but a second (perpendicular to it) projection can help it, so according to possibility and anatomy, most parts of X-ray examinations apply two-directional recording. Besides this there are special recordings, which are suitable for detection of a given structure and for these there is no need for a second (perpendicular) projection. If much more than two projections are produced, then 3 dimensional images can be manufactured by the help of a computer (e.g. cone-beam or 3D DSA).

X-ray appliance consists of an X-ray tube and a detector –in different arrangements dependent on the application field- naturally, with devices ensuring the placement of the patient that is the being examined. Accordingly, a mammogram, an angiograph, a mobile X-ray device, etc. are different. Besides the X-ray recording taken at a given time there is possibility for a so called real time X-ray examination, which is performed by a fluorescent device and a process can be followed at the same time by the help of an image intensifier on the monitor.

The types of x-ray tests:

- chest X-ray – the so called hard beam technique for the evaluation of the structure of lung/ chest organs (Figure 2.6)

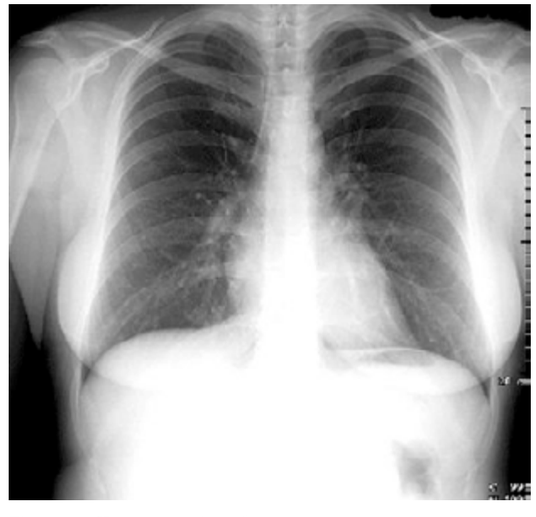


Figure 30. X-ray recording of chest

- any part of the bone system can be tested – for the diseases of face and brain skull as well as of the spine CT or MR tests are carried out.
- native abdomen – narrow indicated area is narrowed by ultrasound and CT-abdominal tests *(figure 2.7)*
- gulping trial – the contrast medium test of oesophagus *(Figure 2.8)*

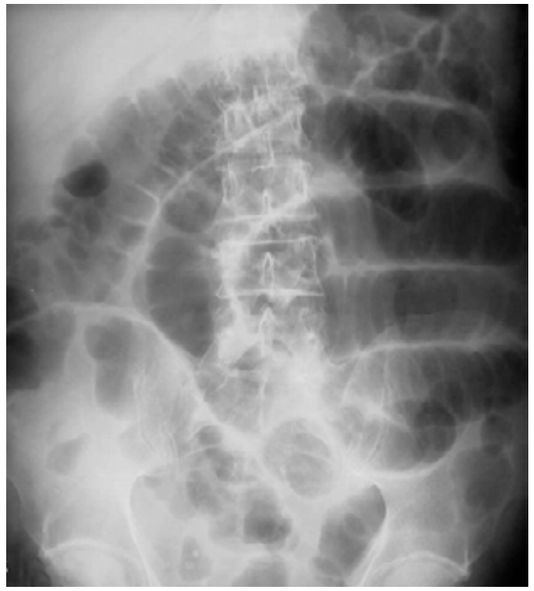


Figure 31. plain abdomen recording- small intestinal obstruction: dilated small intestines, filled with gas can be seen

- stomach X-ray – the contrast medium test of the stomach, it is hardly ever performed nowadays, gastrocopy has several advantages
- selective small intestinal test – it is the examination of the small intestinal through filling with barium and filling material (methylcellulose) – double contrast hypotonic examination.

Figure 32. swallowing test- narrowing caused by oesophageal cancer

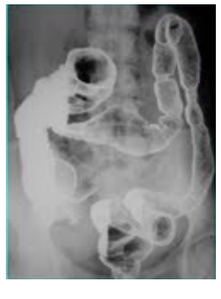


Figure 33. Irrigoscopy- Multiple narrowing caused by Crohns disease

- irrigoscopy – the examination of the large intestinal through filling contrast medium, generally besides barium with insufflation of air, so the lesion of mucous and intestinal wall can be better evaluated *(Figure 2.9)*
- urography – an x-ray examination performed after administering contrast medium, secreted through kidney
- mammography – soft part radiography, an X-ray examination of mammas with higher spatial resolution
- dentistry examination
- angiography – selective contrast medium examination of arteries and veins, by injecting water soluble contrast medium into the veins by the help of a catheter *(Figure 2.10)*.
- several luminal organs or lesions can be detected through filling contrast medium such as ductography – X-ray examination of milk ducts with contrast medium, hysterosalpingography – X-ray examination of uterus and uterine tube, fistulography – the X –ray examination of fistulas with contrast medium, etc.

The indication circle of X –ray examinations is reduced by the expansion of other imaging examinational possibilities but its importance does not.

Cross sectional imaging is possible by X – rays, this time the projection of structures on each other, summation can be avoided, which can be realized by computer tomography (a special chapter is devoted to this).

A röntgenvizsgálat folyamata

Patient preparation

X-ray examination of bones, chest, or performed by any native, contrast medium free examination does not require any preparation. The examination of gastrointestinal system or its preparation demands special protocol. If the administration of

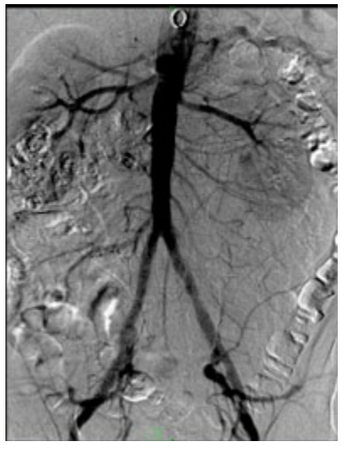


Figure 34. angiographic examination – aorta bifurcation, negative result

contrast medium intravenously is required (urography, angiography), in every case 4-6 hours before the examination the patient is not allowed to drink or eat that is he must have an empty stomach as in the case of potential contrast medium complication such as vomiting/aspiration can occur. Before the administration of contrast medium intravenously, several aspects must be taken into account which will be described in details at CT examination.

Swallowing test

As far as the time of examination can be planned it should be performed in the morning hours. The patient should have an empty stomach on arrival, his neck, chest and abdomen must be metal free. At the examination the patient will swallow contrast medium containing barium –sulphate during continuous X-ray imaging. The upper portion of the gastrointestinal system is depicted. In case of acute examination the patient drinks water soluble, absorbing contrast medium containing iodine (e.g. Gastrografin). After the examination the patient can eat, drink and take his medication provided his condition allows him to do so.

Examination of stomach and upper passage

As far as the time of examination can be planned it should be performed in the morning. The patient should have an empty stomach on arrival at the examination, his chest and abdomen must be free from metal. There are two possibilities for filling the small intestines with barium (Ba). So called upper passage examination is performed for the mono contrast examination, at which the contrast medium, drunk by the patient and emptying from the stomach periodically, is followed by visualization performed at intervals of 20 minutes, to the terminal ileum. The patient is allowed to eat, drink and take his medication after the examination.

In case of acute examination- suspected ileus perforation – the patient drinks water soluble, absorbing contrast medium containing iodine (e.g. Gastrografin).

Selective enterography

A real double contrast X-ray examination, which is suitable for the detection of more subtle lesions, takes place in another way in case of small intestinal, as the gas administered into the small intestinal mixes with the contrast medium unevenly, so it does not have the double contrast effect, besides it can cause painful spasms. The key to the problem is the so called selected enterography , in the course of which strongly adhesive barium sulphate suspension strongly adhesive to the mucous membrane is injected through a probe inserted into the jejunum loop until the height of ligament of Treitz (ribbon), then the lumen is filled with thin methylcellulose solution to ensure adequate transparency. If methylcellulose is not available, then cold water can be applied as a second contrast medium. The small intestine is filled steadily with the great quantity of fluid column injected through the probe, the contrast medium reaches the terminal ileum rapidly. Generally there is no need for smooth muscle relaxant, the reflex paralysis produced by the great volume usually ensures adequate distension. By all means it must be avoided that methylcellulose should get into the stomach because it can lead to the failure of the examination due to the intense nausea, vomiting, which might occur as a result. The time of the examination should be in the morning as far as it is possible. The patient should have an empty stomach on arrival for the examination. His chest and abdomen must be free from metal. If it is possible, a disposable gown for the patient must be ensured. The patient can eat, drink and take medication after the examination.

Irrigoscopy

The day before the examination the patient should have a fibre free diet and performs colon cleansing with a laxative (e.g. magnesium sulphate, X-prep). The patient can drink a little and take his medication before the examination. The patient changes his clothes and puts on either a nightdress or a single-use gown. He lies on the examination table, on his side with his knees pulled to his abdomen and the irrigator is inserted in this position after injecting barium-sulphate into the large intestinal, the colon is filled with air during fluent X-ray visualization. In certain cases the examination is requested acute, so the patient cannot be prepared for it. In this case water soluble, absorbing contrast medium containing iodine is used. The patient can eat and drink after the examination if it was an arranged, planned examination. The patient must be warned that if he is susceptible to obstipation, then he should drink more fluid or take laxative if it is necessary after the examination. After an acute examination, the diagnosis proved by the examination will determine what should be done next.

Intravenous urography

The patient should have an empty stomach for 4-6 hours prior and be sufficiently hydrated (at least 1 l water should be drunk before the examination) on arrival for the examination. Before the administration of the contrast medium, information about the potential contraindications must be obtained. In case of allergy to contrast medium, experienced at a previous examination with contrast medium, the examination cannot be performed. It is important that the patient should have a blood test result, recently obtained, with detailed functional kidney test (creatinine, carbamide, eGFR values). Precise information about his actual medication treatment is also necessary still before the injection of the contrast medium (the administration of antidiabetics containing metformin must be discontinued before and 48 hours after the examination)

The examination with contrast medium is contraindicated because of particular basic diseases (e.g. Waldenström, myasthenia gravis etc.).

Computer tomography (CT)

At CT imaging X – ray radiation passes through a thin slice of the body from several directions (Figure 3.1). The detectors placed opposite the source of radiation measure the attenuation of X –ray radiation, on the basis of which in a mathematical way attenuation can be determined on each point/ volume element of the body causing it. The profile of attenuation of the human body can be very diverse but the sum of the attenuation of different tissues can also be the same, which appears in the photo as the same size density (Figure 3.2).Thus the grey shadows appearing in the traditional X –ray pictures are in proportion to the average attenuation of all the tissues covered by the X –ray passing through the body. On the other hand, CT displays the average attenuation of a given volume element with much more accuracy than the traditional X –ray examination.

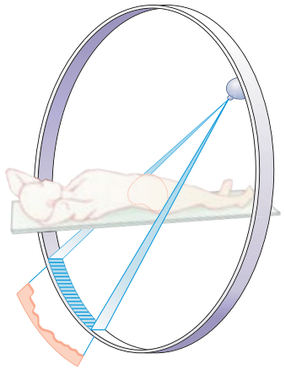


Figure 35.
The principle of CT imaging

A very simple model can be seen in Figure 3.3. For practical reasons the object being examined consists of elements with the same density and the radiation beam passes through each of them. Radiation is measured on the other side of the object. As each element is the same, so the attenuation is in proportion to the elements in rows. The numbers, below and on the right side of the object, display the measured attenuation in each row and column. The numeric pattern of the object is made up of the measured values, added in the way that can be seen in the figure (Figure 3.3)

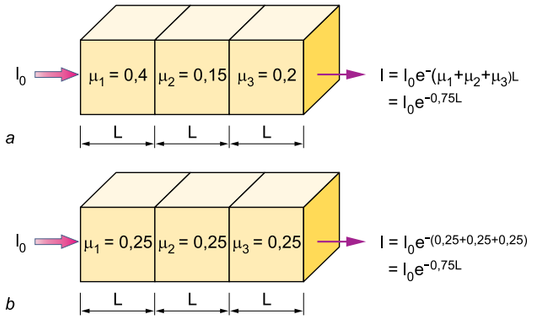


Figure 36 The principle of attenuation. Different attenuation elements and B identified attenuation elements when summed up can cause identical attenuation

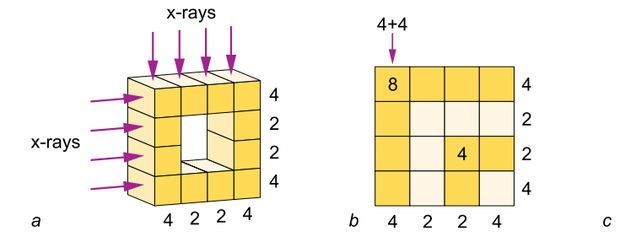


Figure 37. Informational numeric model on the basis of multi directional measurement

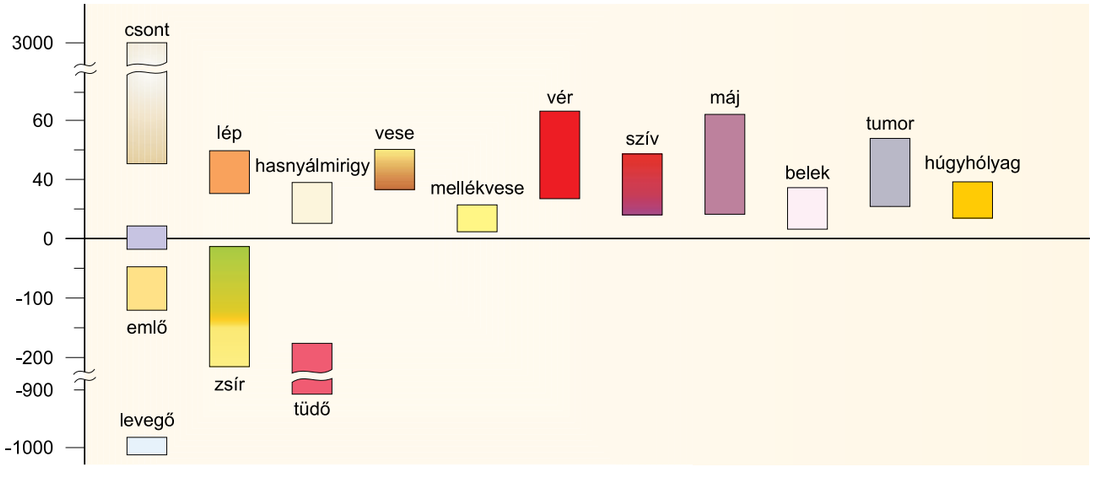


Figure 38. Hounsfield scale

These values are transformed to a number scale (Hounsfield), the numbers of which are co-ordinated to grey shadows. Hounsfield scale has two distinctive units, namely the value of air (HU)-1000 units, water 0 HU (Figure 3.4), theoretically the scale is limitless in positive direction, in practice CT devices are set to +3000 units.

There may have three reasons for attenuation in human tissues:

- change in the physical density of tissue,
- change in the thickness of tissue
- change in the average atomic numbers of elements building up the tissues.

Hounsfield value of soft parts (density) is placed at 0 on the scale (–100- +80), bone in positive, while lungs filled with air in negative (Figure 3.4). Humane visual capacity can differentiate restricted number of shadows of the grey scale (40–60), so it is not worth to correlate a specific shadow to each value of the whole Hounsfield scale. Thus the so called "windowing" technique, which is determined by the organ/lesion being examined, has been introduced to view the images. The window, which can be selected freely, has two parameters

- 1. the width of the window, which regulates the number of grey shadows,
- 2. the centre of the window regulating the light intensity. Narrowing the width of the window increases picture contrast, decreasing window centre increases the intensity of light (Figure 3.5).

A CT image is a digital picture, the elements of which are pixels determined by rows and columns. As the slices have some kind of thickness, so each pixel represents a small volume element, a voxel.

A voxel gives the spatial resolution of CT scan which is determined by the matrix size and the field of view. The slice thickness is usually selected between 1-10mm, dependent on the size of the lesion, the domain being studied can be optional nowadays (e.g. at chest-abdomen-small pelvis it is 80-100 cm). In multidetector CT scanners the detectors are placed not only in one row but in 16, 64, 128 rows, which means that data can be collected, by a single rotation of the radiation source, not only for the measurement of one slice but of several slices or it means that data can be collected concerning one volume and out of them slices of optional

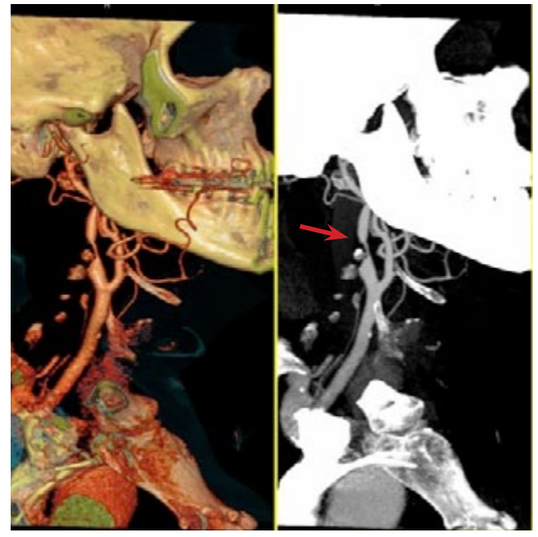


Figure 40. 3 D reconstructed picture. Significant narrowing (arrow) on the internal carotid artery

thickness and 3D pictures can be reconstructed (Figure 3.6). The other advantage of MDCT scans is that measurement is extremely rapid that is the time resolution of CT measurements has also improved, at the latest appliances the data necessary for a picture can be obtained within 0,5 second.This for example allows us to take excellent CT scans of functioning, moving heart by these appliances.

CT pictures – as any other digital photo – can be evaluated later, HU scale units can be determined on specific points or areas of the picture besides windowing, geometrical measurements, as well as reconstructions of different planes can be performed.

The parts of a CT scanner *(Figure 3.7)*

- Gantry: X –ray tube and detectors are placed in it, in the middle of it there is a circle opening, in which the examining table slips in.
- The diameter of the opening is generally 60–70 cm, which allows fatter patients to be put in.
- Generator – produces energy necessary for the X –ray tube

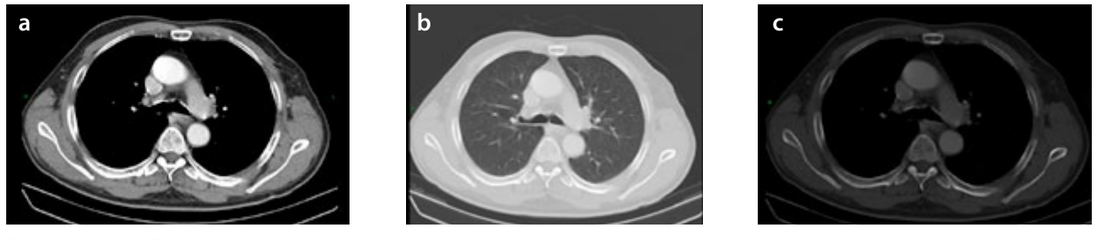


Figure 39. a, b, c. Windowing
a) soft part window (400/40), b) ung window (2000/5000), c) bone window (1500/500)

Figure 41. CT instrument

- Examining table: can be moved forwards and backwards, dependent on the desired body organ being studied. Nowadays the weight limit is 150–180 kg, the scanner cannot move a body heavier than that appropriately.
- Examining console and computer, placed outside the examination room for controlling the examination.

Patient preparation

CT scanning can take place without administering any contrast medium to the patint, in this case preparation is not needed. Intravenous contrast medium is used in several cases and at abdominal examinations even per os contrast medium is used. When a contrast medium is administered intravenously, the patient is not allowed to eat or drink 4–6 hours prior to examination that is he must arrive with an empty stomach, as vomiting/aspiration may occur in case of potential complication.

Before CT scanning it must be decided if the patient requires any kind of/specific preparation. The following questions must be made clear in the course of CT registration:

- If kidney function is normal
  - > 130μmol/l serum creatinine level means potential kidney damage, as intravenous contrast media are nephrotoxic.
- if the patient has contrast medium allergy
  - in case of non-ionic contrast media, its frequency is reducing but anaphylaxis shock might as well happen in more serious cases. The administration of contrast medium can have some posterior complications (1 hour- 7 days after the examination) such as erythema, itching, headache, nausea, dizziness, diarrhoea, shivering, fever.
- if the patient takes antiglycaemics containing metformin
  - it can cause lactic acidosis in case of diabetic patients with kidney malfunction. CT can be performed but administration of medication must be discontinued 48 hours prior to the examination and can be continued only 48 hours after the examination if the kidney function has not deteriorated after the examination.
- if the patient has hyperthyroidism, thyroid cc
  - the extreme iodine amount administered by the contrast medium can cause thyrotoxicosis, so in these cases the administration of contrast medium is absolutely contraindicated.
- if there is intestinal perforation
  - examination can be performed with water soluble per os contrast medium
- non-co-operative patient/child
  - CT scanning can be performed if it is indicated under anaesthesia.

Intravenous contrast medium extravasation can occur, which may have to be treated after the examination later on (the given limb must be supported with a bolster/pillowed and compressed).

When the gastrointestinal system is examined – CT enteroclysis, CT colonoscopy – the intestinal system requires naturally special preparation, the details of which are beyond the scope of this chapter.

Aspects of radiation protection

Radiation burden of CT exams can be 5-100 times more in comparison to X-ray examinations, examining a similar anatomical region, which means that indication of the CT examination must be carefully considered. The appropriate selection of examinational methods and parameters as well as the adequate application of radiation protection rules are of great importance, as well. The elevated radiation burden can affect the potential accompanying staff in the form of diffuse radiation.

Types of examination

- cranium (skull) CT – it can be either without contrast medium (e.g. trauma, bleedings) or with contrast medium (e.g. detecting metastasis) (Figure 3.8)
- spinal CT – intervertebral discs can also be evaluated but nowadays spinal CT is performed primarily for the evaluation of bone structures
- chest CT – it is suitable for the examination of any organ in the chest, it is routinely applied for the examination of aortas, lymph nodes (oncological staging), lungs. The examination of lung parenchyma is possible by CT scanning with great resolution (HRCT, UHRCT), which is suitable for the detection of more subtle lesions. Intravenous contrast media are often used at chest examinations.
- abdominal small pelvis – it is the most common imaging diagnostic method of abdominal and small pelvis organs after the ultrasound.
- Per os and intravenous contrast media are routinely applied. Besides parenchyma organs, one part of the diseases of gastrointestinal system can be examined accurately (e.g. appendicitis) (Figure 3.9.)
- CT enteroclysis- CT scan after filling small intestinal with filling material (methylcellulose)
- CT colonoscopy – CT scan after filling large intestinal with water or air. The 3D reconstruction of photos, taken at the detailed examination of the intestinal structure and the precise evaluation of the intestinal wall and its surroundings are possible (Figure 3.10)
- CT urography – it is suitable for the examination of the urine system, contrast medium intravenously must be administered.
- CT angiography – the whole vascular system can be examined after administration of contrast medium intravenously (Figure 3.11)
- cardiac CT – the functions of heart, the coronaries can be well evaluated on the dedicated device. Administration of contrast medium intravenously is necessary (http://www.youtube.com/watch?v=OBybaBBD124).
- Perfusion CT examination – the quantitative determination of tissue perfusion is possible by this method after administration of contrast medium
- CT scan of bone structures

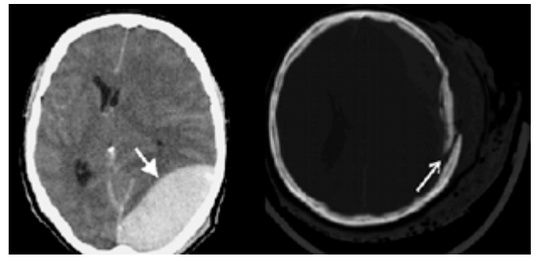


Figure 42. Skull CT- epidural haematoma- with soft part and bone windowing

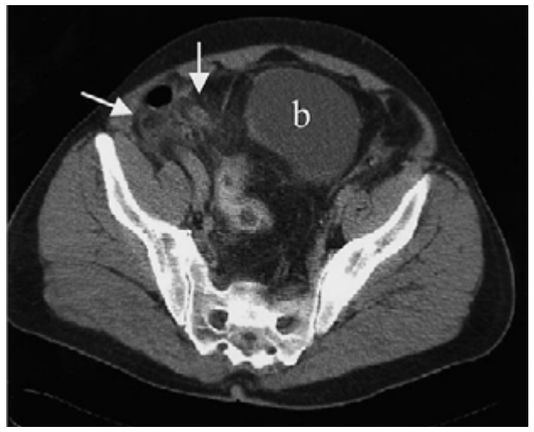


Figure 43. CT picture of appendicitis

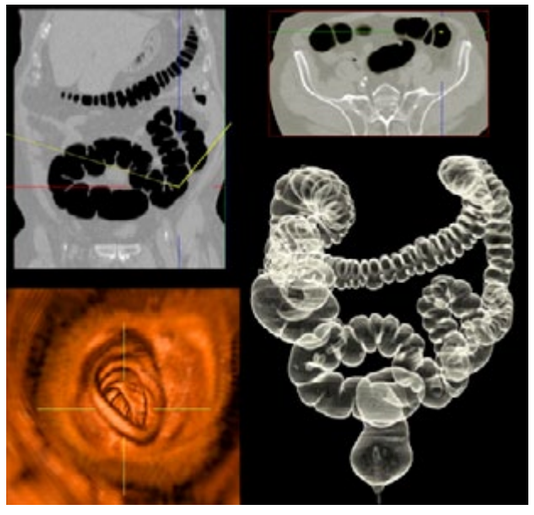


Figure 44. Virtual colonoscopy

Ultrasound imaging

Molecules making up fluid medium are in continuous accidental movement (Figure 4.1). If there is power impulse on the medium, which is transmitted by a piston in the Figure

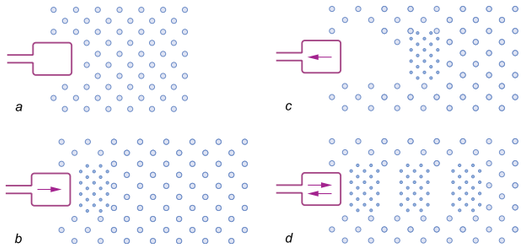


Figure 46. a, b, c, d. The formation of ultrasound waves

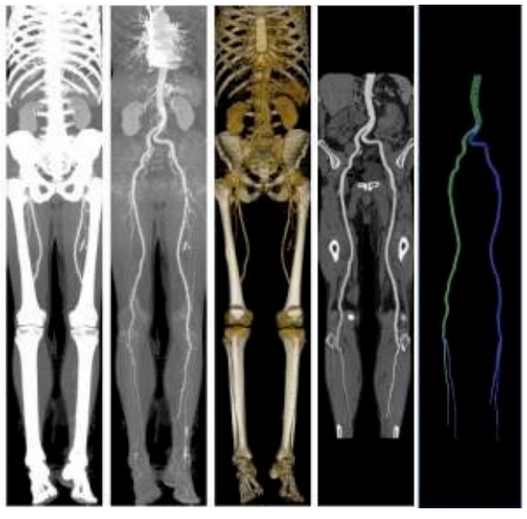


Figure 45. CT angiography

4.1, then the molecules will concentrate in front of the piston, consequently there will be increased pressure on this place.

As the piston moves the molecules forward due to power transfer, the area of higher pressure moves to the opposite direction of the piston. The mechanical disturbance caused in the medium goes away from the "source of the disturbance", which source would be the transducer in the application of the ultrasound imaging diagnostics. If this process is periodically repeated, then the process causes wavelike mechanical disturbance (vibration) in the medium, which is a longitudinal type of wave – the movement of the molecules and the direction of wave transmission are parallel (Figure 4.1.d). Sound is a vibration like this, the ones at the frequency of 20–20,000 Hz (0.02–20 kHz) can be heard by human ears. The frequency of ultrasound waves, applied in imaging diagnostics is 1–100 MHz domain.

In the ultrasound diagnostics the ultrasound is generated by the help of piezoelectric crystals, which alter their volume with adequate frequency in case of fluctuating voltage by this generating the above mentioned piston-like movement. Three important parameters of ultrasound waves are frequency (this parameter determines the capacity of penetration and resolution of the wave), wavelength (it determines the size of ultrasound pulse) as well as the product of multiplication of the two which is the velocity (by the help of this structures located deep can be determined). In most tissues the velocity of ultrasound is 1540 m/sec. The amplitude of ultrasound pulse describes the degree of pressure oscillation which is related to the tissue movement caused by vibration. The amplitude determines the 'loudness' of the ultrasound pulse that is the energy content of it. In diagnostic application it is generally important to know the relative amplitude of pulse that is for example, to what extent the amplitude is reduced while passing through a tissue of a given thickness .As the ultrasound passes through the material such as for example human tissues, it interacts with the material in several ways. From among these interactions, some are necessary for ultrasound imaging (e.g. attenuation, reflection), but other interactions lead to false products, which are not desirable from the point of imaging.

As the ultrasound passes the material, it continuously loses its energy, which is usually called attenuation. Several factors contribute to the energy loss of ultrasound, maybe the most important is absorption, in the course of which the ultrasound energy converts to heat. The absorption of ultrasound pulse depends on two main factors

- the type of material, through which ultrasound passes – *(http://tamop.etk.pte.hu/apolastan/english.html)*,
- the frequency of ultrasound pulse, which can be described by the attenuation coefficient.

From among the tissues, materials building up the human body, the lungs and the bones have big attenuation coefficient, which gives an explanation for the fact why the lungs and bones as well as the structures behind the bones cannot be examined by ultrasound. Also water has the smallest attenuation, which means water transmits ultrasound perfectly.

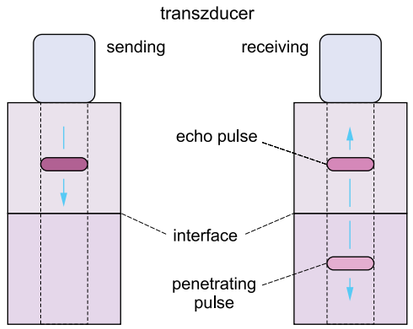


Figure 47. advance of ultrasound wave /reflection

Water in the body or rather fluid (e.g. in the cysts, urine bladder) practically opens window on the structures, which can be clearly seen by this, below it.

The reflection, from different structures, of ultrasound pulse provides the basis for ultrasound imaging. The reflection of ultrasound pulse is produced at the surface area of different materials (Figure 4.2). To create reflection on the border surface (EDGE SURFACE), there should be a difference between one distinctive feature of the two materials, namely the so called acoustic impedance. The acoustic impedance is related to the density and elastic features of the material.

At the edge surface in human body only one part of the ultrasound is reflected, the pulse is mostly divided, one part is reflected and creates an echo, and this echo returns to the transducer. The other part of it penetrates the subsequent material, as Figure 4.2. shows it. The light intensity of a structure in the ultrasound photo depends on the fact how strong it reflects, that is how it reflects the ultrasound pulse, which is based on the difference of acoustic impedance of the two materials composing the surface area. (This is why it is well-known that gel is used at ultrasound examinations to reduce the acoustic impedance between the transducer and skin surface and by this energy transmission should be the most optimistic. Gel ensures that there should remain no air between the transducer- and skin surface.)

At the surface area of most soft tissues, only a small part of the ultrasound pulse is reflected, as a consequence the reflection process forms relatively small echo. At the surface area of the soft part and bone, stone or gas a strong reflection is created.

Ultrasound image is formed by ultrasound beam sweeping one slice of the body (figure 4.3). In each sweeping line one pulse is transmitted to the body, and if there is a structure, which reflects this ultrasound pulse, then the reflected pulses form an echo, the transducer converts them to electronic impulses.

The ultrasound image is formed by processing the electronic impulses. The structures forming echo are determined by two factors:

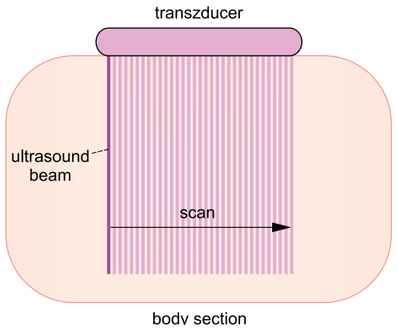


Figure 48. the principle of ultrasound sweeping

- the distance and depth of the reflecting structure is calculated on the basis of the time passed between the emission and reception of the pulse,
- the horizontal and lateral expansion of the structure is ensured by the knowledge of the location of echo situated next to each other. The amplitude of the returning echo represents the intensity of the reflection.

This can be described graphically, where the amplitude of the reflected pulse is displayed dependent on the distance (A-method), or it can be described in a picture, where the echo amplitude means the light intensity of the reflecting structure. This latter is called B-method, which means the traditional ultrasound picture (2D, 3D). Unfortunately, the amplitude of the returning echo is influenced by the absorption taking place in the tissue. This phenomenon can be compensated by a technique, the so-called time- reception compensation (TGC, Time Gain Compensation), which can compensate significantly the absorption effect and on the monitor or rather in the picture the appearance of the structure is determined by the structures producing echo or by the characteristic of the reflecting one. The special area of ultrasound imaging is Doppler- imaging, which is based on the physical principle of Doppler effect. Doppler effect or shift is produced when the source of a wave, the medium transmitting it or the sensor observing it are on the move compared to each other. Typical area of application is the measurement of the flowing direction and velocity of the blood flowing in the body, as the velocity of the flowing blood cells and flowing direction is in proportion with the shift of Doppler frequency. If blood flows towards the transducer, the frequency of the reflected ultrasound increases because of the Doppler effect. If blood flows from the transducer, the frequency decreases. Doppler pictures– *http://tamop.etk.pte.hu/apolastan/english.html,* are generally colour-coded taken as a function of the flow direction and relative velocity – *http://tamop.etk.pte.hu/apolastan/english.html* (Figure 4.4). (**http://www.youtube.com/watch?v=OBybaBBD124**).

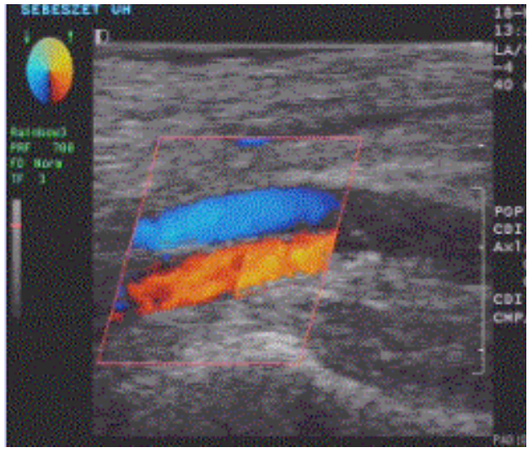


Figure 49. Colour Doppler examination- a. and v. poplitea

Main parts of the device

Transducer

The piezoelectric crystals, which produce ultrasound waves and detect them, are located in the transducer. The distinctive parameter of the transducer is the frequency, which determines the circle of usage of the transducer. Dependent on the examination area – e.g. surface structures, abdomen, endoluminal – the geometrical formation of the transducer changes.

Treatment surface

It is for the examinational parameters, the adjustment of examinational type and registration, documentation can be controlled from here.

Figure 50. ultrasound instrument

Monitor

It is for the real-time visualization of the examination (Figure 4.5).

Biological effect

The ultrasound used in diagnostic imaging propagates in a bundle, which is focused on a small area, and the power on one area unit is called the intensity of ultrasound bundle (pencil of ray) (watt/cm^2). The transmission of ultrasound energy in tissues can be characterized by intensity, and the amount of this must be taken into consideration when judging biological effect and security. Transducers applied in diagnostics emit ultrasounds of some mW/cm2 intensity. Most of the ultrasound energy absorbed in tissues converts to heat.

Aspects of patient preparation

At the examination of neck, extremital veins, joints, surface soft parts (e.g. thyroid, breasts, testis) there is nothing special required . In abdominal or small pelvis examinations it is important that the patient should have an empty stomach and full bladder (suspension of meals reduces the effect of gas formation, attenuation of ultrasound is minimal in a filled bladder, so the structures under the bladder can be well-examined). Besides these some practical advice is to avoid drinking coffee, smoking and chewing gums.

Areas of examination

As mentioned above the lungs, bones and structures behind the bone cannot be examined by ultrasound, neither can the structures of the cranial cavity, except for the examination prior to the closure of the fontanelles (Figure 4.6). From among the organs in the chest, the ultrasound examination of the heart must be highlighted, echocardiography (Figure 4.7) – *http://tamop.etk.pte.hu/apolastan/english.html*. The most common imaging diagnostic examination, applied widely is the ultrasound examination of abdomen and small pelvis. Pregnant (gravidity) ultrasound must be mentioned especially – *http://tamop.etk.pte.hu/apolastan/english.html* (Figure 4.8). It is used for the examination of surface soft parts (e.g. thyroid, cervical lymph nodes, mamma) as well as for the examination

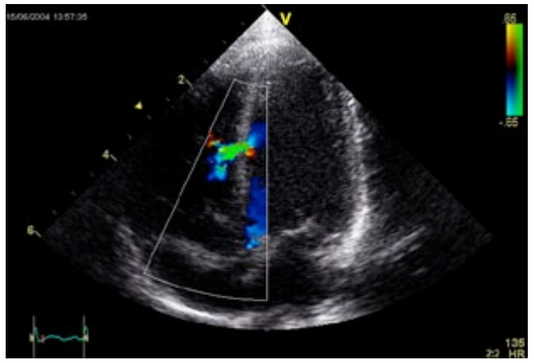


Figure 52. the ultrasound examination of heart- colour Doppler picture of ventricular septum defect

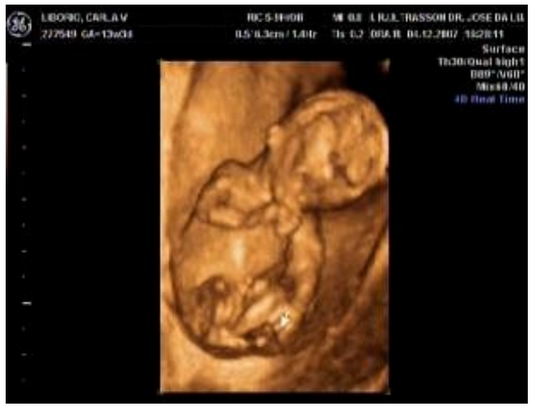


Figure 53. Gravidity ultrasound picture

of joints more and more often. Doppler ultra sound is used for the examination of the veins and blood flow, it is also called colour Doppler when it is colour-coded. The most often examined vessel area is the carotid decay, or femoral or popliteal artery, one part of the abdominal aorta can also be examined dependent on body build.

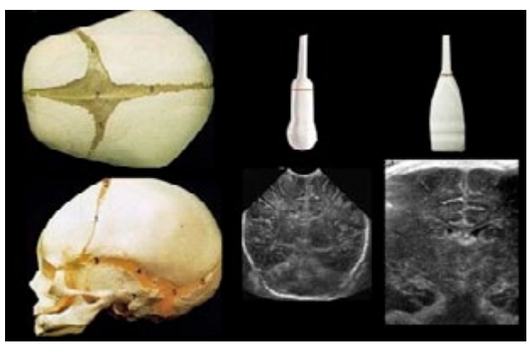


Figure 51. Neonatalis agy UH-vizsgálata

Magnetic Resonance Imaging (MRI)

imaging was the discovery of great importance in the 1970s. It spread in clinical practice in the 1980s. The basis of its function is the nuclear magnetic resonance, NMR described in 1946. From among the creators of MR imaging, Sir Peter Mansfield and Paul Lauterbur, were awarded the Nobel Prize in 2003.

The atoms, in which there are odd number protons, possess magnetic spin that is it can be imagined like tiny, atomic magnets. If these 'miniature' magnets are placed in a strong external magnetic space, then they will orientate according to the lines of force in the external magnetic space. This orientation is parallel with the lines of force but regarding the poles

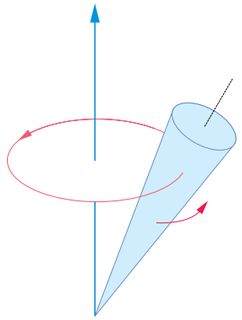


Figure 54. A mágnesek precessziós mozgása

of the magnetic miniature there will be so called parallel and anti – parallel orientated magnets. The two orientations mean two energy conditions at the same time, which conditions are penetrable (traversable) that is in case of energy intake of adequate form and size (radio frequency waves) some of the spins of lower energy condition can be generated and after the termination of generation, this energy is taken in radiates in the form of radio waves. This latter process is called relaxation, which can be described by two types of time constants, namely T1 and T2 relaxation time. In reality the miniature magnets are not static but they rotate enclosing an ankle with an axle they perform a so called precession movement (like a swinging whirligig), the frequency of which corresponds to the frequency of the radio waves suitable for generation (Figure 5.1). This frequency is called Larmor frequency, which depends on the type of the given atom and the intensity of the external, magnetic space.

MR imaging is basically based on the hydrogen atomic nucleus, the proton as hydrogen is present in the human body – primarily because of its water content- in great concentration, but the hydrogen content of fats, proteins and carbohydrates is significant. The contrast of the MR picture is affected by three basic features of protons: the density of protons (e.g. water content), the T1 and T2 relaxation time (inner contrast factors). Therefore strong, external, magnetic space is necessary for the MR examination, which can take in human body. Nowadays two types of magnets are used, permanent magnet in case of lower field intensity (0,2-0,5 Tesla) while higher magnetic field intensity (1-7 Tesla) is provided by superconductor magnets (Figure 5.2 and 5.3). The magnets of low field intensity, regarding their arrangement, are open magnets, they surround the patient from two sides, while in the magnets with high field intensity the patient lies in a shorter- longer tunnel. This often causes problem for claustrophobic patients, who cannot tolerate the feeling of being enclosed – that is the MR examination.

At MR examination plenty of excitation- relaxation cycles take place (pulse sequence) and the radiated, emitted radio frequency waves, which are called echo, are detected by the help of antennas (coils) and are converted to electronic signals, which are recorded and analysed by a computer (Figure 5.4). These antennas are efficient if they are placed close to the 'reception", so the coils are created so that they should be placed to the part of body being examined as close as possible. Ac-

Figure 55. Open MRI instrument

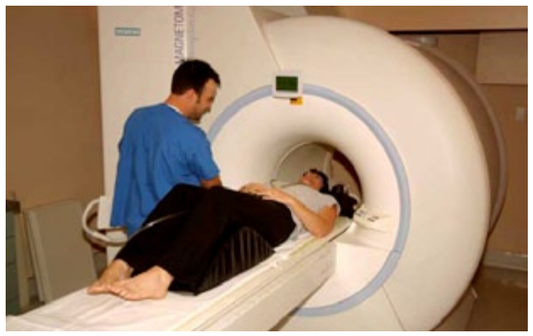


Figure 56. Closed MRI with strong field force

Figure 57. Surface body coil – for abdominal, chest examinations

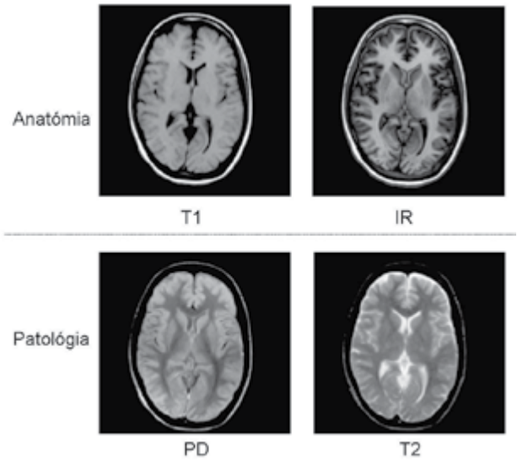


Figure 58. Különböző kontrasztú transzverzális síkú MR-képek a koponyáról

cordingly, there are coils for skull, spine, abdomen, chest, joints etc. In the latest MR devices even several coils can be placed on the patient, but it is more typical to examine only one region with one coil and adjustment. Dependent on the fact what and how should be visualized, different measurement series, pulse sequences can be selected. The diverse sequences result in pictures with different contrast, resolution and series, the information content of them can be different (Figure 5.5). The contrast of pictures can be influenced significantly by the adjustment of pulse sequences. Besides morphological pictures, there are some methods among the MRI methods, which can provide functional data, even taken as a function of time. MR measurements require different time, in general, it can be claimed that the time of data collection is longer compared to other diagnostic methods. It means that the patient's co-operation is necessary at the examinations, as a measurement can last from a few seconds to a few minutes. Nowadays there are more and more rapid measurement methods, which e.g. allow us to prepare one or more slices during one withheld breath, or it is suitable for rapid visualization of a bigger area being studied.

To sum up, MR examination relatively lasts longer and requires more co-operations from the patient than the other imaging examinations. At MR scanning the picture contrast can also be influenced by the administration of contrast medium, from among which the most widely used are media containing gadolinium (Gd).They are usually applied in small quantities, intravenously (0,1-02 ml/tskg), allergy to contrast medium is very rare , so the patient should not have an empty stomach at the examination .At MR scanning multi plate visualization is constructed , thus pictures can be taken besides the three anatomical plates, being perpendicular to each other, in any inclined plate, as well, which allows us to visualize and evaluate a structure more accurately (e.g. in case of an inclined axial plate leaned on a n. opticus, the whole optic nerve run can be seen in one slice.

Structural imaging

Almost the whole human body can be visualized by MR imaging. As tissue contrast basically depends on proton density that is water content, the change of the latter can be followed by MR imaging excellently. Almost all the pathological lesions in human body is accompanied by water content change , thus the soft part contrast of MR scanning can be considered the best in comparison with the other methods. There are two types of tissues, the water concentration of which is lower specifically, the lungs and compact bone, which should not be examined by MR (MR examination is not practical). MR scanning is of primary importance in the field of skull and spine examinations, as well as it is also of extraordinary importance in the examination of joints.

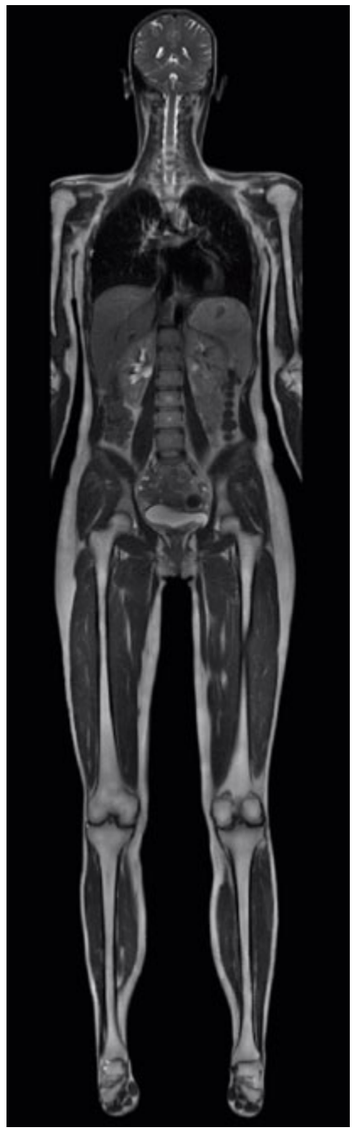


Figure 59. Whole body MR examination

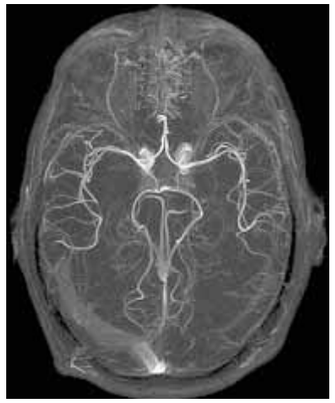


Figure 60. MR angiography of the arteries of skull – examination performed without contrast medium

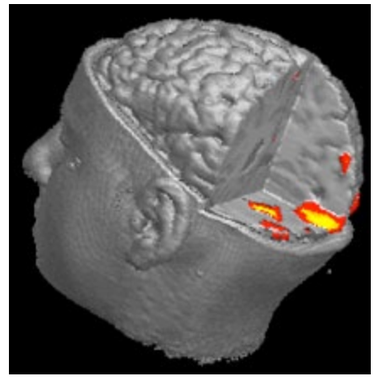


Figure 61. Functional MRI – the cortical representation of visual function

(http://www.youtube.com/watch?v=OBybaBBD124).Abdominal organs can also be examined well by MR scanning nowadays, it usually applied for differential diagnostic purposes after CT examination, in fact, whole –body scanning can be performed at one sitting (Figure 5.6)

MR angiography

Artery structures and certain veins can be visualized without injecting contrast media into the vessels, but there is also MR angiographic measurement when contrast medium intravenously (chest, abdominal and limb) is used for visualizing artery structures (Figure 5.7).

Heart MRI

Data collection is synchronized by heart movement by the help of ECG, as a result heart can be visualized in any plate in any single phase of movement or pictures can be taken either in one or more slices in different movement phases of the heart. On the basis of these functional and morphological data can be collected as well as the perfusion conditions of heart muscle (myocardium) can be mapped by the application of contrast medium which plays an enormous importance in the ischemic heart diseases. MR angiographic examination of coronary vessels can become possible by further technical developments.

(http://www.youtube.com/watch?v=OBybaBBD124).

Diffusive MRI

It is a type of measurement for the detection of molecular movements of water molecules. The two major application fields of it are the early visualization of brain infarctions as well as search and detection of tumour in the whole body.

It proved to be useful in several differential diagnostic questions.

Functional MRI

Brain activity can be detected by MR scanning, which is based on the local tissue perfusion taken place on the activated area as well as the change in oxide-oxyhemoglobin rate. Important fields of application are surgical planning prior to neurosurgery as well as the research of brain function (Figure 5.8)

MR spectroscopy.

It is a measurement method for the detection of certain metabolic products besides imaging. The rate, loss or appearance of detectable metabolic products can be a differential diagnostic signal. Nowadays it is mainly used in the diagnostics of brain tumour and cancer of the prostate.

Patient preparation – security aspects

MR examination does not apply ionizing radiation, as the photo energy of radio frequency waves is significantly lower than this. The primary security aspect of MR examination is related to the strong magnetic field, which can interact with the metal objects in human body. The other important interactional form can be formed with the electronic devices, consequently for patients with pacemakers, MR examination is absolutely contraindicated. Attention must be paid to the permanent built-in medication dose pump, built-in hearing aid, brain stimulating device. Likewise it is necessary to consult with a radiologist in case of any built-in endoprothesis and metal fixation, as well. The removable metal objects (metal shiver, foreign body) got into the body also mean contraindication. The devices, built-in the body, and containing metal, are nowadays made from non-magnetic, so called MR-compatible metal, so if the latter is in the patient, the examination can be performed safely.

In so far as accompanying staff enters the examining room, security regulations must be kept and agreement must be made with the colleague controlling the device, regarding the potential sources of danger.

There can be several dangerous situations because of magnetic metal objects flying out of the pocket (e.g. scissors, pen, key, coins) and the magnetic field can also cause fatal damage to e.g. bank cards, watch, etc.

(http://www.youtube.com/watch?v=OBybaBBD124).

MR examination usually does not require any preparation. Naturally the metal objects (clothes, jewels, removable denture), disturbing or potentially a danger to the examination, are removed from the patient prior to the examination. The complications of intravenous MR contrast media are extreme-

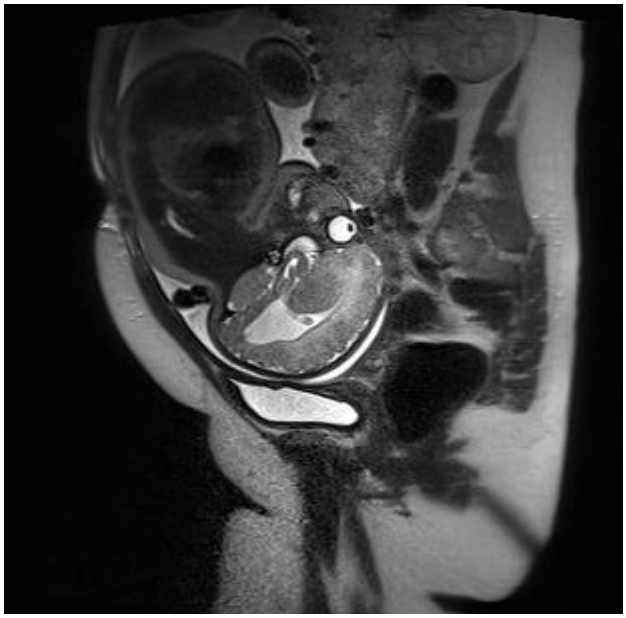


Figure 62. Embryo MR examination

ly rare, so food and drink intake is allowed prior to examination. In the first trimester of gravidity (pregnancy), MR scanning is not recommended, however, there is no proven, effect of the MR examination on the embryo. From the second trimester, MR examination can be performed, in fact embryo MR examinations are under significant development (Figure 5.9).

The energy of radio waves in human body converts to heat in 90%. With the increase of magnetic reception the frequency used for excitation increases, as well, which increases the absorbing energy – the effect of this is important only over 1 T reception. This is why the security system in the MR devices calculates the amount of energy per body volume prior to each measurement and if it exceeds the secure domain, then it bans its measurement. (Remember that the blood flow transfers the heat generated effectively from the given area)

MR examination is accompanied by special noise, which does not mean any security risk, however can be very unpleasant for certain patients.

(http://www.youtube.com/watch?v=8oI9YnhPNcQ).

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29. Electocardiography

BY PH.D. BALÁZS RADNAI, NOÉMI FULLÉR, NIKOLETT GÁL, PH.D. ANDRÁS OLÁH

Physiological basics

Electrocardiography means the recording of the electrical activity of the heart over a period of time. The paper-based recording produced by this procedure is the (EKG – ECG). It must be discriminated from the so-called electrocardioscopy (EKS – ECS), which is a medical technological procedure for monitoring patients, without the production of a recording.

In order to understand the formation of ECG charts – having regard to the above definition –the electrical activity of the heart, its temporal changes and the options for its recording should be acquainted with first. The introduction will give an overview above these.

Impulse generation

The heart has its own stimulus production made up of specialised myocardial cells – independently from the general impulse production capacity and conductivity of the myocardium – for the synchronised activity of the heart.

The primary location for production of impulses or pacemaker is the sinus node located on the wall of the right atrium, which generates impulses at a frequency of 70±10/min, this pace is called the normal sinus rhythm. The secondary impulse-generating location or pacemaker is the atrioventricular node which generates impulses at a frequency of 50/min, this is the nodal rhythm. The tertiary location is the bundle of His, generating impulses at a frequency of 30/min, which is called the idioventricular rhythm. The secondary and tertiary pacemakers only generate impulses physiologically, if their respective superior pacemaker does not function. Impulse conduction can be well illustrated experimentally with Stannius ligatures placed on a frog heart as follows:

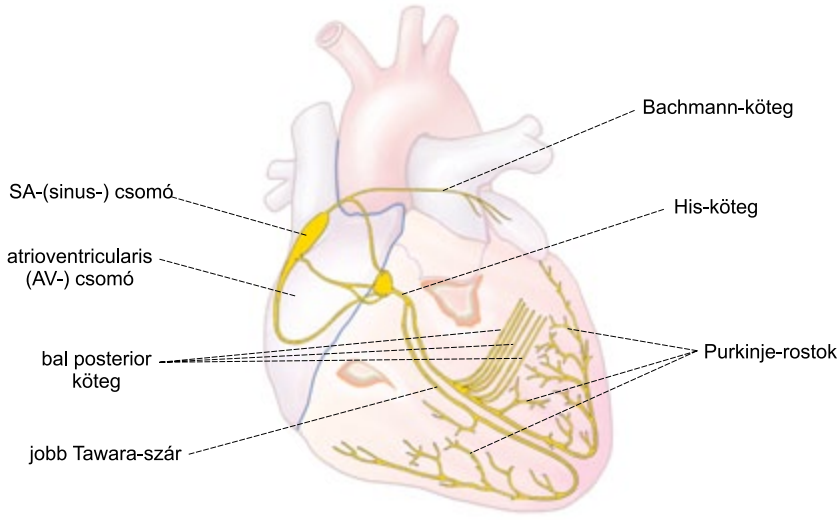
- *Stannius-I. ligature:* placed around the junction between sinus venosus atrium which causes the sinus node to pulsate, but the heart stops under the ligature for a short time then it continues to beat, but at a slower rate. In this case the atrioventricular node generates impulses.
- *Stannius-II. ligature:* placed around the atrioventricular junction, which causes the atria to pulsate at an unchanged rate but the ventricle stops for a long time, then starts beating again at a very slow rate. In this case impulses are generated by the His bundle.

Impulses in the heart can be generated outside the pacemakers, and external/ectopic impulses also can be generated, which cause extrasystole.

Conduction

The impulse generated in the sinus node is conducted by the specific conduction system of the heart and by the membrane of myocardial cells. The impulse is conducted from the sinus node to the atrioventricular node by the three bundles in the wall of the atrium, which are the following: Tractus internodalis anterior (anterior internodal band)

- or Bachmann's bundle; Tractus internodalis medialis (median internodal band)
- Wenckebach's bundle; and Tractus internodalis posterior (posterior internodal tract)
- Thorel's bundle.



Picture 1.
A szív ingerületvezető rendszere

These bundles conduct impulses at a rate of 1 m/s. The atrioventricular node then conducts the impulse at 0,02–0,05 m/s which is slow, therefore the depolarisation of the ventricles is delayed in comparison with that of the atria. The impulse is conducted from the atrioventricular node to the His bundle, then to Tawara's branches, and finally to the Purkinje fibres which conduct the impulse at 2–4 m/s. The Purkinje fibres have direct access to the myocardial cells, and the myocardial cells conduct the impulse at 0,3–1 m/s.

Electrophysiological basics

In an electric field the voltage shows the amount of work per unit charge against an electric field to move the charge between two points. It is measured in volts (or joule/coulomb).

The voltage related to an assigned zero point is called electric potential. If there is an electric potential difference between the two points, connecting them with a conducting medium results in the flow of electric charge, i.e. electric current to equalise potentials.

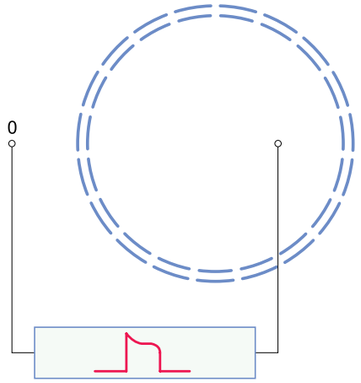
The chapter firstly will give an introduction to intracellular electrophysiological processes, followed by an introduction to the potential change conductible from a single cardiac muscle cell by a superficial electrode pair. After the overview of the cellular process, the interpretation of the electric activity of the whole muscular system of the heart will be aimed at.

Intracellular electroPHYsiology

As seen in the physiological summary, there is a potential difference between the intracellular and extracellular spaces of each cardiac muscle cell, given that the distribution of ions not flowing freely through the semi-permeable membrane is unequal on the sides of the cellular membrane. This potential difference is maintained by active transport processes – mainly the Na^{++}-K^{+}-ATPase. If the membrane becomes permeable for charged ions, the potential difference attempts to become equalised under electric current.

Consequently, the generator of electricity is the fast, voltage-sensitive sodium channel, which on opening enables sodium ions to flow towards the intracellular space, thus resting potential starts rising sharply and action potential is created by the all-or-none principle. Ion flow is accompanied by electric current in the opposite direction, since by convention the direction of electric current is defined by the direction of the flow of negative charge.

Action potential is created in the individual myocardial cells not at the same time. Consequently, potential difference occurs not only between the intracellular and extracellular spaces of individual cardiac muscle cells but also between adjacent cells, that is, several vector potentials are created in each moment. The sum of these vectors gives us the electrical vector of the heart which is constantly changing in direction and size.



Picture 2. Action potential formation on the semi-permeable membrane

Spherical model

In order to understand the formation of electrical signs resulting from the electrical activity of the heart, which can be conducted from the surface of the body, let us observe the phenomena of the following model. Of course, this model offers a significantly simplified picture of the formation of potential difference between superficial electrodes and its visualisation.

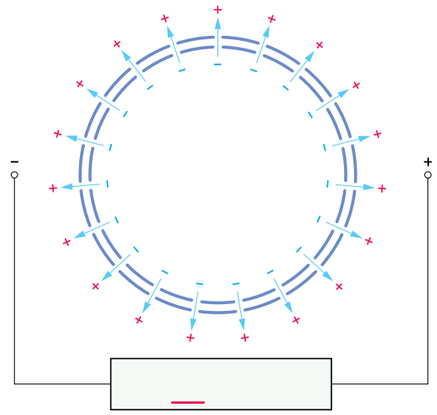
The following simplifications have been made in comparison with physiological conditions to introduce the model:

- charge distribution is demonstrated on a spherical surface instead of the accurate morphology of the myocardial cell,
- only the transmission of a single electrical impulse is studied in the model at one time,
- variations in the transmission rate of the impulse are not observed, i.e. even transmission is assumed,
- we will neglect the fact that the resting (negative) potential reaches a positive value at the formation of action potential; only increase up to 0 mV is studied (this does not cause significant distortion, but facilitates understanding significantly),
- the transmission of the electrical impulse is studies only within the projection of the detecting electrode pair (its significance will be discussed later).

Within the sphere negative potential is measured at rest in relation to the surface, which is the consequence of unequal distribution of ions between intracellular and extracellular space. This distribution is maintained by active transfer.

This potential difference can be experienced on the whole surface of the sphere at rest. The sum of a number of dipole vectors (indicated by blue arrows) make up a zero vector, so no voltage can be measured between the two electrodes. The recording displays a horizontal line the amplitude of which belongs to zero potential; i.e. an isoelectric line.

Electric impulse (marked with a red flash) causes positive charge to flow into the cell (sodium ions), resting potential increases, the equal distribution of charge on the surface of the sphere disperses. Potential difference is formed between the detecting electrodes, thus increasing voltage is measured. The electrical vector is directed towards the positive surface.

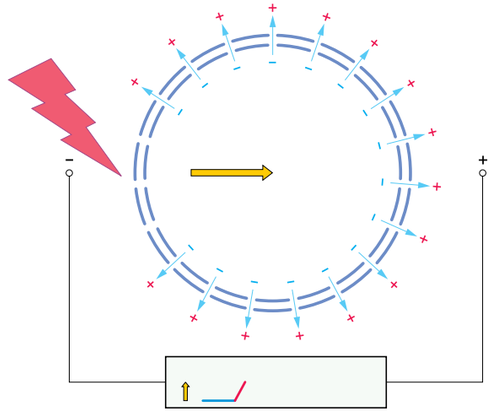


Picture 3.

The vector points to the direction of the positive electrode, thus the recording signals voltage with a positive excursion.

Potential vector increases continuously parallel with the transmission of the depolarisation impulse: the voltage conducted from the surface of the sphere is constantly increasing, thus an increasing positive excursion can be measured on the recording.

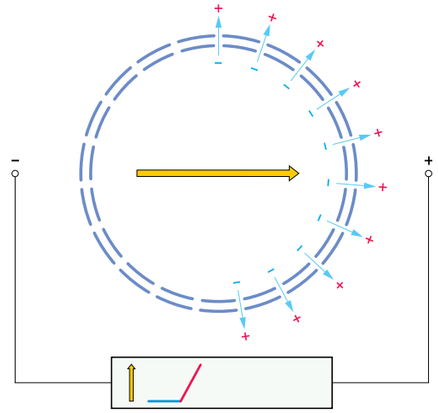
The increase in the amplitude continues until the difference between polarised and depolarised areas reaches its maximum, that is, until half of the surface of the sphere is depolarised.



Picture 4.

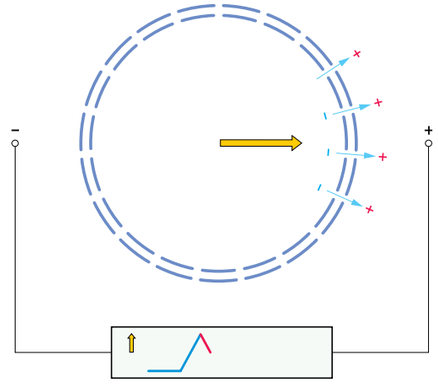
The potential difference is decreasing between the two detecting electrodes with the transmission of the depolarising electrical impulse, so the voltage measured is still positive but the amplitude is decreasing.

In complete depolarisation no potential difference can be measured between the two electrodes, therefore we get back to the isoelectric line. However, it ***must not be forgotten*** that the polarisation measured between the interior of the cell and the environment would be the opposite of the resting potential at the same time.



Picture 5.

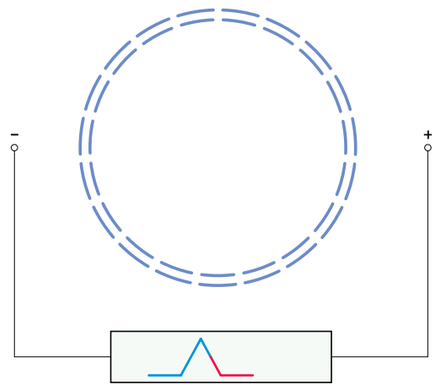
During the reduction of polarisation the sphere – in lack of electrical stimulus – regains its resting potential. The direction of this process is the opposite of the direction of polarisation in our model – just as it is under physiological circumstances as well. Therefore the direction of the electrical vector does not change: it still points to the direction of the positive



Picture 6.

electrode. Consequently, although the charge distribution in progress is contrary to depolarisation, the excursion in the recording is still positive.

In case of repolarisation the maximum of the amplitude of

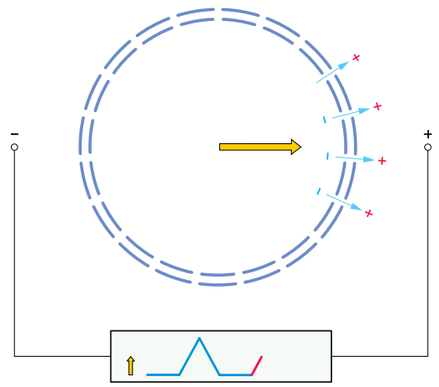


Picture 7.

the potential difference (voltage) at that moment is when half of the spherical surface is in a repolarised state.

With the progress of repolarisation positive voltage can be measured but with a decreasing amplitude.

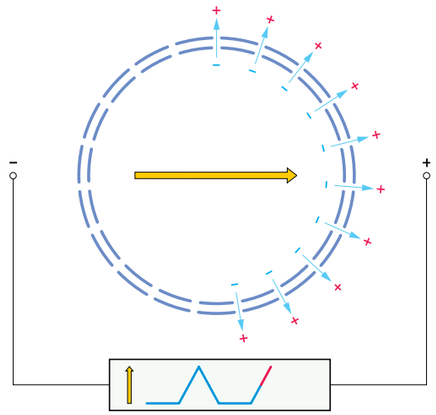
In case of complete repolarisation – exactly as in the initial phase – no potential difference can be measured between the detecting electrodes, thus an isoelectric sign can be detected.



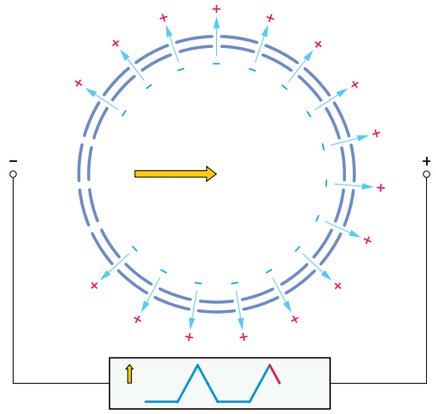
Picture 8.

According to this model, the following conclusions can be drawn which also are applied in electrocardiography:

- In case of a depolarisation wave heading to the positive electrode, continuously increasing positive potential can be measured until half of the surface becomes depolarised.
- During the further transmission of the impulse positive excursion can be measured with decreasing amplitude.

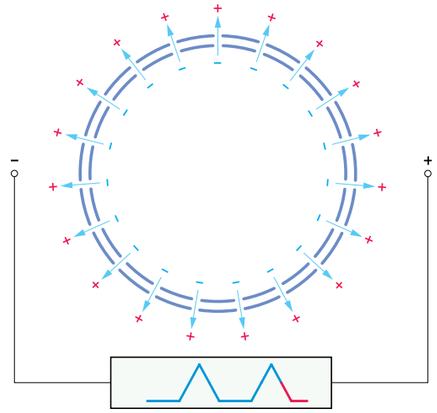


Picture 9.



Picture 10.

- At the termination of both the resting (polarised) and depolarised states isoelectric excursion is detected.
- Repolarisation current with a direction opposite of that of depolarisation will result in positive excursion as well.



Picture 11.

The model also shows:

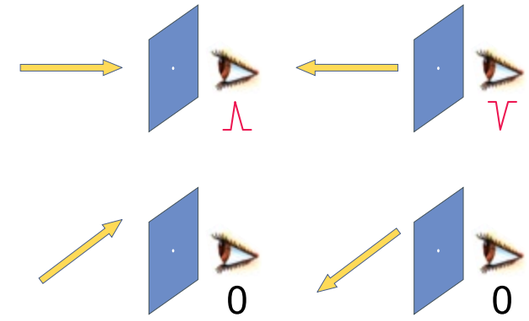
The full myocardial repolarisation process proceeds to the opposite direction of depolarisation: while depolarisation proceeds from endocardium to epicardium (pericardium), the direction of repolarisation is epicardial-endocardial. Therefore the direction of the wave representing depolarisation (T) coincides with that of the depolarisation wave (QRS). In case of new-borns and infants the direction of repolarisation also is endocardial-epicardial, that is, the direction of the repolarisation T wave is the opposite of the main excursion of the QRS complex representing depolarisation.

The detection of electrical activities: unipolar and bipolar leads

In case of unipolar leads the detection of electrical activity is realised through an active electrode, therefore – with an example borrowed from the field of mechanics – myocardial electrical activity is observed and perceived from one point. Consequently, the directions of vectors can be detected by applying unipolar electrodes, but the magnitude of electrical vectors cannot be deduced.

In case of applying bipolar electrodes the potential difference (voltage) between two active electrodes is recorded, that is, both the direction and the magnitude of the vector component projected on a given plane can be studied.

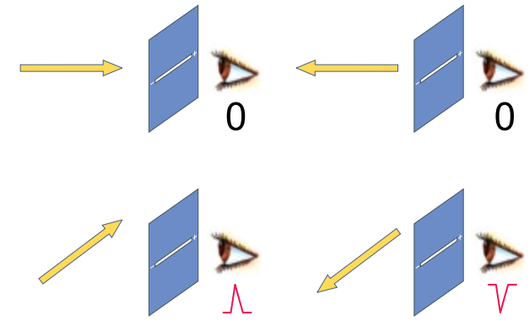
Considering the above pictures it can be observed that while concerning unipolar leads no excursion can be detected in case of vectors parallel to the observed plane, in case of bipolar leads the same applies to perpendicular vectors.



Picture 12. unipolar leads indicate only the directions of potential vectors, their magnitude cannot be deduced directly. The measured amplitude is proportional to distance, not to the magnitude of the vector

Electrophysiological processes of the heart

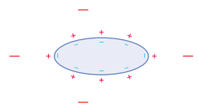
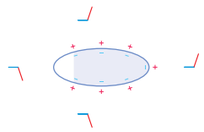
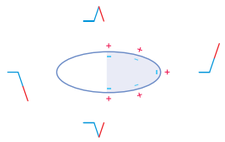
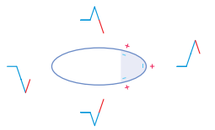
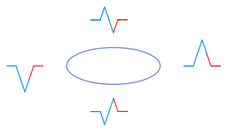
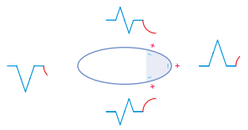
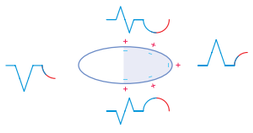
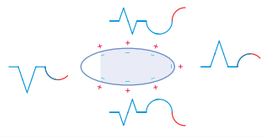
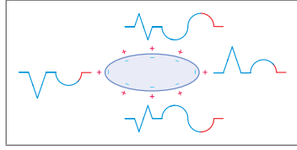
In the following section the electrophysiological process of impulse production and conduction will be discussed.



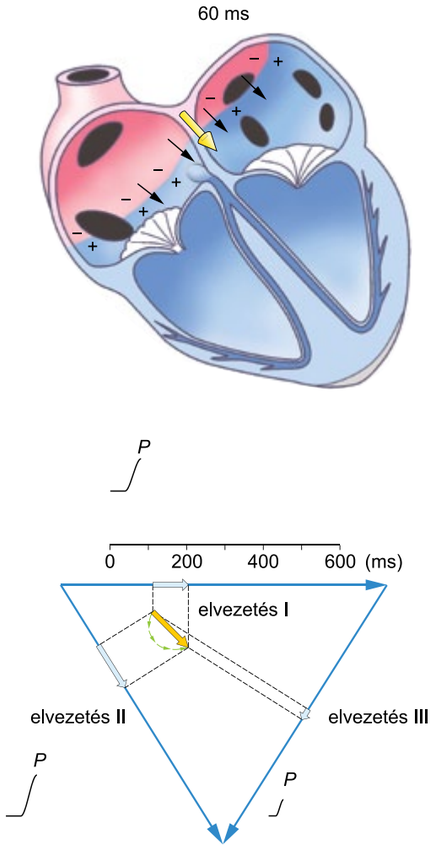
Picture 13. bipolar leads are able to represent both the direction and the magnitude of the potential-vector projected on the plane of the lead.

1. Sinus impulse production: the development of action potential of the nodus sino-atrialis, which does not involve detectable excursion in ECG. The size of this area is such an insignificant percentage of the volume of the entire myocardium, that it cannot produce a detectable electrical sign. However, it must be noted that sinus impulse production may be detected with special ECG examinations.

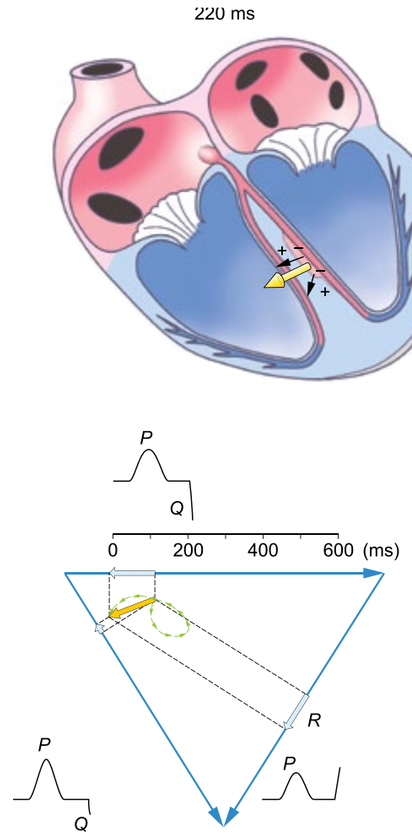
Table 1. The electrical consequences of transmission of impulses

Resting (polarised) state	
	Superficial potential difference cannot be detected at the resting state of the myocardium (however, transmembrane voltage can be measured), thus excursion can be measured on neither of the electrodes (isoelectric line).
Depolarisation	
	During depolarisation the electrode in the direction of the transmission of the impulse detects positive voltage, while the opposite electrode detects negative voltage. In the leads perpendicular to this axis either positive (on top) or negative (on the bottom) voltage is measured due to not perfectly symmetrical charge distribution.
	As long as half of the mass of the myocardium is not depolarised the electrodes within its plane show increasing amplitude. The excursion of perpendicular electrodes at the displayed moment return to the isoelectric line, since the potential-vector is perpendicular to these leads.
	(Impulse) transitional zone is the moment in time when half of the myocardium becomes depolarised.
	As depolarisation progresses, no change in polarity can be detected in the electrodes on the axis, but the amplitude of excursions decrease. The direction of excursion in perpendicular leads is reversed (i.e. approaching current starts to recede and vice versa), therefore the excursion displayed becomes reversed.
	At the end of depolarisation – in lack of electrical current – all leads return to isoelectric line; voltage can be detected on none of the electrodes.
Repolarisation	
	The direction of repolarisation is the opposite of that of depolarisation. It does not mean that it is initiated on the muscle area depolarised last, but that it starts from the epicardium instead of the endocardium. It is represented as in the picture only for didactic reasons, which represents the distribution of charge appropriately. Consequently, the repolarisation wave results in the same excursion as depolarisation wave (charge is reversed twice).
	Based on the same mechanism as discussed in case of depolarisation, the leads parallel with the axis will reach their maximal excursion when half of the myocardium is repolarised, while excursion returns to the isoelectric point in perpendicular electrodes.
	With the propagation of repolarisation, when more than half of the mass of the myocardium is repolarised, a change in the direction of the potential led from perpendicular electrodes can be detected.
Resting (polarised) state	
	At the end of the repolarisation isoelectric excursion can be detected in each electrode, concerning that no superficial potential difference occurs.

2. Depolarisation of the right, then of the left atrium: the impulse is propagated to the right atrium first, mainly by diffusion, and depolarises it, then being propagated to the left atrium through the interatrial pathway, induces the depolarisation of the left atrium.
3. The impulse would be propagated from the atria towards the ventricles, but it encounters delay due to the slow conduction of the AV node. Take notice that this mechanism ensures that the contraction of the ventricles takes place only after ejection from the atria. This period is represented by an isoelectric line in the ECG curve.
4. Septal depolarisation: the wave travelling along the His bundle and to the ventricles depolarises the septum first, creating the q wave in leads with axes directed to the septum.
5. Apical depolarisation: the impulse is propagated from the septum towards the apex cordis, represented by a positive excursion (R wave) in most leads.

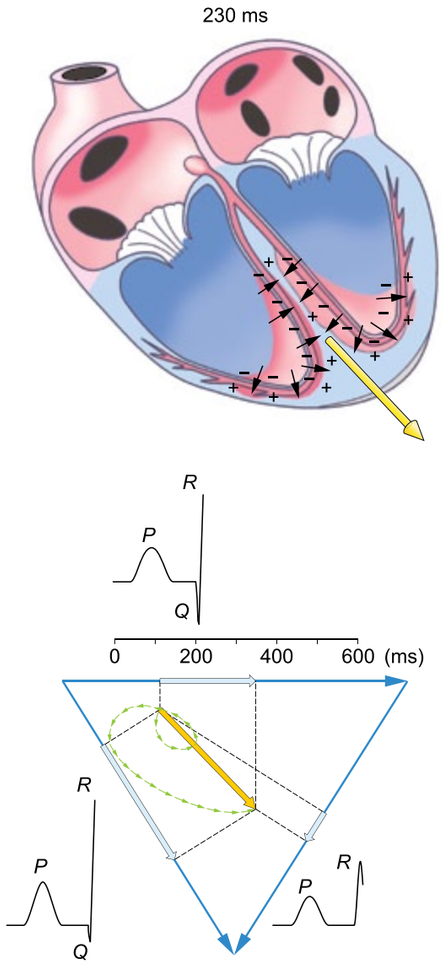


Picture 23. Atrial depolarization

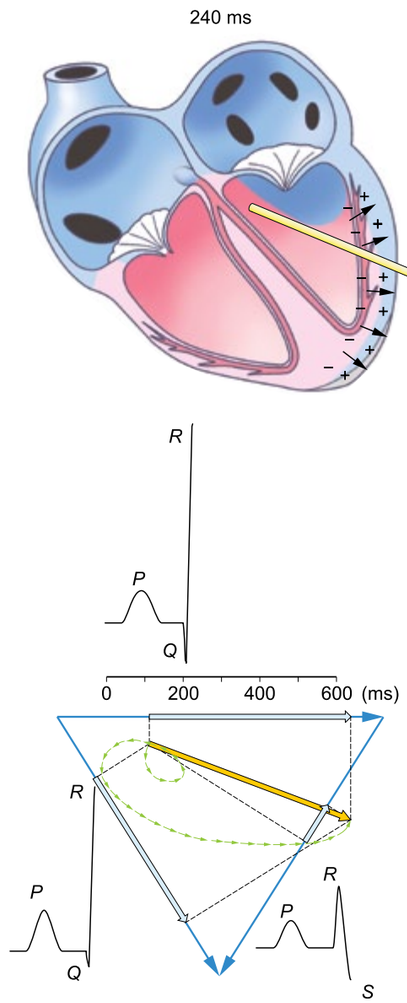


Picture 24. Septal depolarization

6. Depolarisation of the right and then the left ventricle: the impulse is propagated from the direction of the apex to the right, and then to the left ventricle. Maximum deflection is detected when the amplitude of the main electrical vector is at its peak, i.e. half of the volume of the myocardium becomes depolarised. (Intrinsicoid deflection=ID). Meanwhile atrial repolarisation takes place, resulting in no excursion due to the dominant electrical sign of the ventricles. (However, occasionally it can be detected as a T_a wave before QRS complexes).



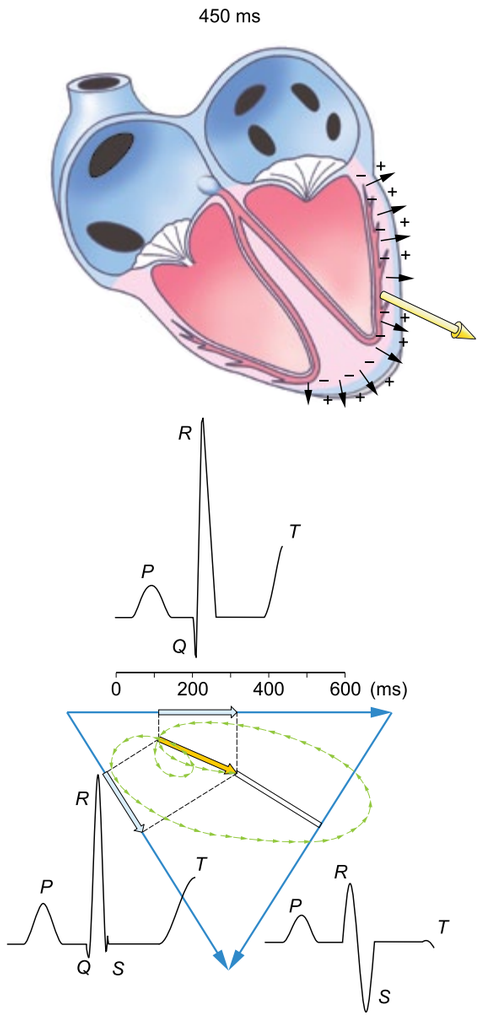
Picture 25. Apical depolarization



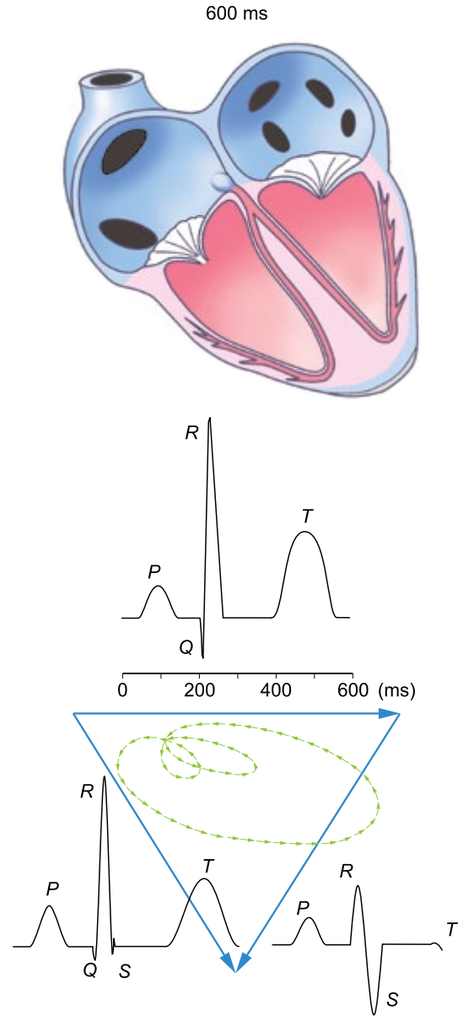
Picture 26. Left ventricular depolarization

7. Ventricular repolarisation: ensuing complete ventricular depolarisation which is represented with a positive deflection (T wave) on the ECG recording due to the mechanisms discussed above.

8. Resting state: the period subsequent to full repolarisation lasting until the next sinus impulse, which is represented by an isoelectric line on the ECG recording.



Picture 27. Ventricular repolarization



Picture 28. Ventricles repolarized

Electocardiography

The working principle of electrocardiography

The electrical activity of myocardial cells – action potential initiated by an impulse, the processes of depolarisation and repolarisation – result in unequal charge distribution on the surface of the heart, which can be recorded with electrodes placed on the body surface.

ECG leads can be unipolar or bipolar. In case of bipolar leads the device measures the difference between the potentials of two points, while in case of unipolar leads it measures the potential of a given point in relation to a "0" potential point.

Bipolar leads include Einthoven's limb leads – leads I, II and III. Goldberg's limb leads – VR, VL, VF – and V1-6 thoracic/chest leads are unipolar.

The technique of electrocardiography

Einthoven's bipolar standard limb leads

The three measurement points defined by the electrodes placed on the right hand, the left hand and the left leg create an isosceles triangle around the heart (Einthoven's triangle). The bipolar leads created by these points (marked as R-Right; L-Left; F-Foot) allow for the measuring of potential difference between two points as follows:

- *Lead I:* the voltage between the left arm electrode and the right arm electrode
- *Lead II:* the voltage between the right arm electrode and the left leg electrode
- *Lead III:* the voltage between the left arm electrode and the left leg

With these leads the heart is "circuited" by 60-60 degrees. The potential differences between the measuring points of the leads are vectors the magnitude and direction of which changes depending on time. These potential vectors point from the negative pole to the positive pole. According to Einthoven's law the sum of the potential differences between leads I and III are equal to the potential difference measured at lead II.

$$I. + III. = II.$$

Placement of limb leads:

- red – R (Right): right arm
- yellow – L (Left): left arm
- green – F (Foot): left leg
- black N (Neutral): right leg; this electrode is the earthing electrode.

Two colour coding systems are known concerning the placement of electrodes; AAMI (Association for the Advancement of Medical Instrumentation) and IEC (International Electrotechnical Commission), the latter one is shown above. The former is used in American states and Australia, while the latter standard is used in European countries.

AAMI colour codes for the above are the following:

- White – RA: right arm
- Green – RL: right leg
- Red – LL: left leg
- Black – LA: left arm

Goldberger's unipolar limb leads

These are unipolar limb leads using the measurement points defined by Einthoven. It means that the electrodes at R, L, F measurement points measure the potential of the given point as related to an indifferent point with zero potential. According to Einthoven's law a zero potential point is obtained by connecting the three limb measurement points where the three electrodes are connected through high resistance. The potential different obtained this way is very low, therefore Goldberger introduced augmented limb leads, which increases the potential difference significantly, by 50%. Unipolar limb leads surround the heart at 60 degrees too, but they are shifted by 30 degrees from bipolar leads.

Unipolar leads are indicated with "V", and the augmented voltage in unipolar leads is marked as "a". Unipolar limb leads are the following:

- aVR – right arm
- aVL – left arm
- aVF – leg

Unipolar chest leads

Wilson's chest leads are unipolar leads, thus the voltage measured in these different leads are related to the indifferent zero voltage point created by connecting the three limb leads. As a component of standard 12 lead ECG 6 unipolar chest leads are applied (marked as V_1, V_2, V_3, V_4, V_5, V_6) which can be complemented with further dorsal and paravertebral leads.

Wilson's unipolar chest leads

V_1 (white/red): in the fourth intercostal space (between ribs 4 & 5), just to the right of the sternum (breastbone)

V_2 (white/yellow): in the fourth intercostal space, just to the left of the sternum (breastbone)

V_3 (white/green): in the midpoint between V_2 and V_4

V_4 (white/brown): in the fifth intercostal space, in the midclavicular line (the line extending down from the midpoint of the collarbone)

V_5 (white/black): left linea axillaris anterior (anterior axillary line), horizontally even with lead V_4

V_6 (white/purple): linea axillaris media (left mid-axillary line), even with lead V_4

Protocol for 12-lead ECG

Necessary devices and tools:

- ECG device
- ECG electrodes – disposable or re-usable
- electrode gel (for re-usable electrodes)
- disposable non-sterile latex gloves
- paper towel

Table 2. 12 elvezetéses EKG készítésének menete

	Steps	Explanation
1.	Check documentation for the necessity of the intervention and verify the patient's identity.	
2.	Inform the patient on the necessity and process of the procedure.	It can improve patient's compliance.
3.	Perform hand hygiene.	In order to prevent nosocomial and cross-infections
4.	Prepare the devices and tools necessary for the procedure.	
5.	Assure adequate environment, isolate the patient with a screen or curtains if necessary, close doors and windows.	
6.	Position the patient, ideally in supine position, or you may elevate the upper part of the body slightly in order to improve comfort. Make sure that the patient is lying in the middle of the bed with the arms beside the body. Expose the chest.	If the bed is too narrow and the patient is unable to lay his arms beside his body, make him place them under his buttocks.
7.	Put on disposable non-sterile latex gloves.	
8.	Place the ECG device near the patient's bed, if necessary connect it to a wall socket, or if the battery is fully charged, operate it by the battery.	
9.	Place the limb electrodes on the appropriate sites: – red – right arm – yellow – left arm – green – left leg – black – right leg If you use disposable electrodes remove their plastic wrapping and attach them to the appropriate sites. In case of re-usable electrodes electrode gel needs to be used.	Make sure that opposing diodes are placed symmetrically. In case of patients with tremor place the limb leads on the trunk instead of the limbs. In case of re-usable electrodes there may not be found an electrode with a colour code representing a limb; in this case the main point is that the colour code of the wire must be correct.

10.	Palpate the clavicle and the first intercostal space with your fingers, then place the chest electrodes on the appropriate sites: – V_1 (white/red): fourth intercostal space, the right edge of the sternum – V_2 (white/yellow): fourth intercostal space, the left edge of the sternum – V_3 (white/green): in the midpoint between V_2 and V_4 – V_4 (white/brown): fifth intercostal space, in the midclavicular line – V_5 (white/black): left linea axillaris anterior (anterior axillary line), horizontally even with lead V_4 – V_6 (white/purple): linea axillaris media (left mid-axillary line), even with lead V_4	Electrodes need to be placed on flat surface; do not place them on bony or too muscular body surfaces. If the patient's chest is too hairy it may interfere with the placement of the electrodes or even disable it, therefore it is recommended to shave hair, but do not use a razor since it may cause micro-injuries. Another problem may be oily/greasy skin, in this case clean it with soapy water or alcoholic wipers. In case of female patients with bigger breasts than the average make sure that the electrodes are placed under the breasts; it may be necessary to hold the breasts by hand – position them to the side and slightly upwards.
11.	Attach the wires to the electrodes; pay attention to correct colour codes.	
12.	Turn on the device. If the device allows it, enter the patient's name and other relevant personal data.	
13.	Instruct the patient to breathe evenly, not to move, not to tense muscles and not to talk since these may affect the ECG curve and cause interference which encumbers assessment.	If the patient shakes, trembles, quivers or suffers from continuous tremor, place the hands under the buttocks to reduce trembling of the limbs.
14.	Check whether the leads are placed correctly and if an appropriate ECG curve can be seen on the display.	If the curves are not regular, adjust the electrodes. Identify ECG waves to exclude malignant rhythm disorders.
15	Record the ECG. The device records 12-lead ECG automatically. Take care that paper speed should be 25 mm/sec by default.	
16.	In case of rhythm disorders the recording of rhythm strips may be necessary; in this case choose the leads you wish to examine. The examiner has to stop the printing of the rhythm strip in this case.	
17.	After recording check if the printed ECG is of adequate quality, i.e. if it can be evaluated. Identify waves in the ECG, exclude the risk of malignant rhythm disorders. If you cannot record the patient's data with the ECG device, then record them in ink on the printed ECG. It is important to record the patient's name and other personal data required by the protocol of the institution, as well as the date of the ECG recording.	If the ECG is not suitable, record again.
18.	Remove the cables, then the electrodes as well. Handle disposable electrodes as hazardous waste, disinfect re-usable electrodes.	In order to prevent nosocomial and cross-infections
19.	Remove electrode gel from the skin with paper towels. Help the patient with getting dressed.	
20.	Clean up the environment of the patient.	
21.	See about the disinfection of the ECG device.	In order to prevent nosocomial and cross-infections
23.	Handle waste appropriately.	
24.	Remove latex gloves, perform hand hygiene.	In order to prevent nosocomial and cross-infections
25.	Document the procedure.	

Supplemental leads

Supplemental unipolar chest leads

Additional unipolar dorsal chest leads are used infrequently. Their application may be indicated e.g. if posterior infarct is suspected. The designations of these unipolar leads are V_7, V_8, V_9, and e.g. in Hungary unipolar leads applied in the sagittal plane also are used as additional leads (VD_1, VD_2, VD_3). In case of a rare form of ECG oesophagus leads can also be used by entering the electrode in the oesophagus.

Dorsal unipolar chest leads

- V_7 – left axillary posterior line, even with V6 (use lead V4 for recording)
- V_8 – on the left, in the line of angulus scapulae, even with V_7 (use lead V_5 for recording)
- V_9 – left paravertebral on the spinous process of the spine, even with V_8 (use lead V6 for recording)

Paravertebral unipolar leads

In case of paravertebral leads applied in the sagittal plane the patient is sitting up or lying on his right side.

- VD_1: Directly paravertebrally, on the left, even with the third dorsal vertebra
- VD_2: Directly paravertebrally, on the left, even with the ninth dorsal vertebra
- VD_3: Directly paravertebrally, on the left, cca. a palm-sized place below the diaphragm (approximately even with L1)

Physiological features of paravertebral (Antalóczy's) leads

- P-wave: isoelectric in VD_1, positive in $VD_{2,3}$
- Q-wave: QS complexes are deep and frequent in VD_1, Q wave gradually decreases in case of $VD_{2,3}$
- R-wave: positive in $VD_{1,2,3}$
- T-wave: negative in VD_1, isoelectric or positive in VD_2-ben, positive in VD_3

Unipolar leads on the right side of the chest

Infrequently used leads allowing for the examination of the right ventricle. They are applied when infarction of the right chamber is suspected. Electrodes are placed as a mirror image of standard chest leads, and the marks V_{1-6} are supplemented with an "r" for "right" (Vr_1 Vr_2, Vr_3, Vr_4, Vr_5, Vr_6). In case of the ECG of the right side of the chest supplemental dorsal leads also can be applied in order to diagnose posterior infarct of the right ventricle.

Lead placements deviating from the standard

Within this rarely applied method the unipolar chest leads are placed not in the prescribed intercostal spaces. The placement deviating from the standard is indicated with apostrophes; when the electrode is placed one space above the prescribed intercostal space it is marked with a single apostrophe (V'), while if the deviation means two spaces, with double apostrophes (V").

Special monitoring leads

In case of patient monitors 3 and 5-lead systems are available. About the placement points of leads, the parameters shown on the monitor and special settings, see the section "Pulse" in the chapter on "Vital parameters".

NORMAL ECG

Formation of ECG waves

ECG waves are named after the letters of the alphabet. The magnitude of the wave is indicated by letters: usually minuscules are used in case of a low deflection, while capitals are used when high amplitude is recorded.

P wave

The first atrial (not sinus!) wave is called the „p" wave.

Characteristics:

- Normally positive wave, except in aVR (negative) and in V1 (it may be biphase)
- Duration: 80–100 ms
- Amplitude: 0,05–0,25 mV
- Best assessed in lead(s I and) II
- The initial phase of the „p"-wave refers to the anomalies of the right atrium, the terminal phase refers to the anomalies of the left atrium.

PQ (PR) distance

The period from the initiation of the „P" wave to the initiation of the QRS complex representing ventricular activation, which includes the „p"-wave itself, together with the time elapsed until the initiation of the ventricular impulse, which is represented with an isoelectric line. If „q" wave is not visible, „PR" distance is observed.

Characteristics :

- Length: 130–200 ms
- Duration depends on age and frequency (increases in case of bradycardia; decreases in case of tachycardia)
- „p" wave followed by an isoelectric stage

QRS complex

QRS complex includes ventricular depolarisation and atrial depolarisation, but the latter has no sign that could be detected with conventional ECG examination.

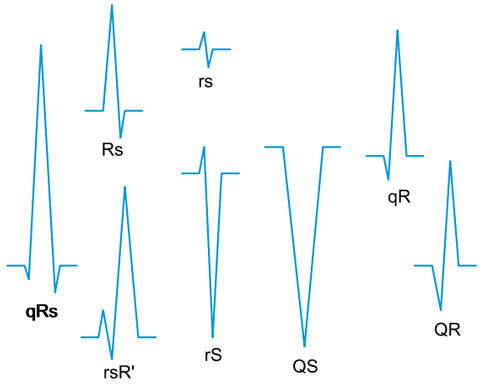
Nomenclature:

- The first deflection of the complex is called "q" wave if it is negative
- The first positive deflection of the complex is called "r" or "R" wave
- Further positive deflections are indicated with apostrophes, e.g. the second positive deflection is marked as "r' " or "R' "
- If a deflection towards the baseline between two subsequent positive waves does not reach the baseline (i.e. no negative deflection takes place), it is called an " RR' " complex.
- A negative wave following a positive "r" or "R" wave is the "s" or "S" wave
- When only negative deflections are detected, it is called a "QS" complex.

Some examples of QRS nomenclature

Characteristics:

- Length: 70–110 ms, the parameter of athletes and adipose individuals approaches the upper limit



Picture 29. Some examples of QRS nomenclature

- It is regarded as abnormal if duration exceeds 120 ms
- Leads with diagnostic values: I, II, III, V_1, V_6
- Characterised by significant morphological heterogeneity

ST segment

The segment extending from the termination of the QRS complex (also called the J point) to the termination of the T wave. Its diagnostic value cannot be overemphasised.

Characteristics:

- Isoelectric, i.e. even with the PR segment
- Duration is frequency-dependent, that is, the duration is reduced with an increase in frequency

T wave

The positive wave representing ventricular repolarisation is called the T wave. (The causes of this positive deflection: see above)

Characteristics:

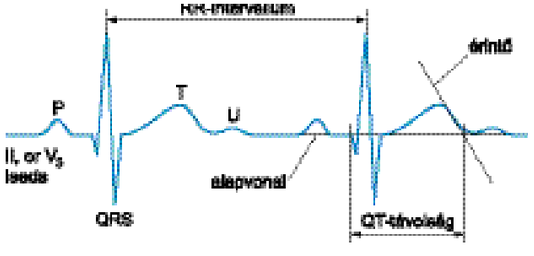
- Amplitude: normal up to 1,5 mV in limb leads, and up to 1 mV in chest leads, but it cannot exceed 1/7 of the amplitude of the R-wave.
- Shape: asymmetric, slowly ascending then descending more rapidly after reaching its peak.
- Diagnostically significant leads: I, II, III, V_5, V_6
- Polarity: negative, positive or biphase in V_1-ben.
- Variant: may be bifid in childhood.

QT interval

QT interval is the distance between the start of the q wave and the point where the tangent line for the steepest part of the T wave intersects with the baseline.

Characteristics:

- Leads with diagnostic value: II, V_3, V_4
- Length depends on frequency and age: shorter in case of tachycardia, longer in case of bradycardiaban
- Usually does not exceed 0.4 second
- Usually shorter than half of the preceding RR distance



Picture 30. A QT intervallum

The extension of this interval utterly increases the risk of sudden cardiac death, therefore it is an emphasised measurable parameter. Due to frequency-dependence corrected QT interval is used for diagnostic aims, which is defined in the following way:

$$QTc = \frac{QT}{\sqrt{RR\ intervallum\ (sec)}}$$

It is expedient to define it in aVL, since here U waves interfering with the measurement almost never can be found.

U wave

U wave – if visible – is a wave following the T wave with the same polarity and with a small deflection (not more than 2 mm). It is most prominent in lead V3. Its origin is not entirely clear, according to certain opinions it represents the repolarisation of papillary muscles and Purkinje fibres. It tends to be more visible in case of low frequency, gracile individuales and females. Its absence is not pathognomonic.

Parameters in physiologic ECG

Source of impulse generation

Under physiological circumstances the impulse generator of the electrical activity of the heart is the sinoatrial node. However, the electrical activity of this area has no ECG signs, thus sinus impulse generation only can be concluded indirectly, from collateral signs.

These signs are the following:

- Rhythmic ECG curve
- Electrical frequency near 70/minute
- P wave morphology indicating the activation of the atria physiologically.

In case any of these factors differ, another impulse generator must be assumed, the description of which will be discussed in the section on "Pathologic ECG".

Regularity (Rhythmicality)

ECG is regular (rhythmical) if the distance between consecutive QRS complexes is the same. The distance of QRS complexes – as it will be shown – refers to ventricular rhythm.

The assessment of regularity is important from several aspects:

- it allows for the identification of the site of impulse generation
- it determines the method of frequency identification
- it signals pathological deviations (see later).

Nevertheless, not every irregular electrical activity is pathological, it is enough to refer to breathing arrhythmia as a normal phenomenon.

Frequency

Frequency can be determined in regular ECG curves if the RR interval and registration speed (standard: 25 mm/s) are known:

$$\text{Frequency} = \frac{25\ \text{mm/s} \times 60\ \text{s/min}}{\underset{\text{square}}{\text{small}}} = \frac{1500}{\underset{\text{square}}{\text{small}}} = \frac{1500}{\underset{\text{square/5}}{\text{large}}} = \frac{300}{\underset{\text{square}}{\text{large}}}$$

Small square… RR interval measured by small squares;
large square… RR interval measured by large squares

In case of irregular rhythm the above method leads to inaccurate results, therefore the following method is to be applied:

By multiplying the number of R waves within 30 large squares (=6 seconds, at a paper speed of 25 mm/s) by ten, the result equals to average frequency.

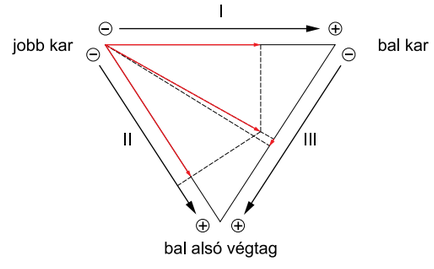
Axis deviation

The electrical axis of the heart is meant by axis deviation; i.e. the direction of the resultant of electrical vectors detected in the moments of depolarisation is determined.

Einthoven's triangle

Einthoven's bipolar leads create a tri-axial reference system of 60 degree angles. The resultant deflection of the QRS complexes of any two leads determines the parameter of the third lead. Consequently, with the help of the resultant deflection of any two leads the third lead can be defined, and even more importantly, the direction and magnitude of the main axis as well. For this purpose Einthoven's triangle is used: measuring the QRS resultant deflections of individual leads on the sides of the equilateral triangle and summing them (creating the intersection of their right-angled projection) we will get the direction and magnitude of the main axis.

The direction of the axis is even more relevant than its magnitude, which also can be defined by identifying a lead where positive and negative deflections are approximately equal, thus their resultant is near 0. The electrical axis will be

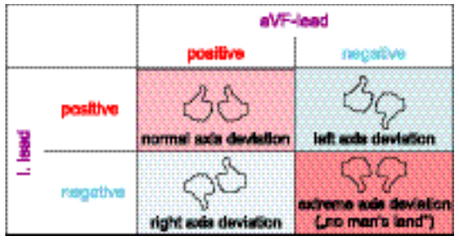


Picture 31. Az Einthoven-háromszög

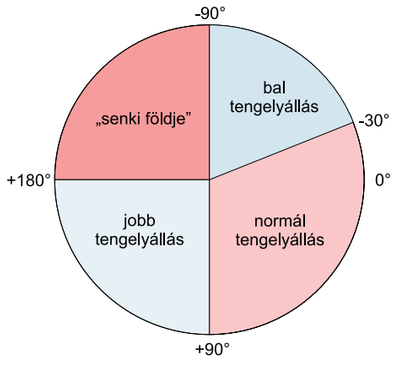
perpendicular to this lead (not forming an absolute deflection on the bipolar lead). In the above picture the deflection of lead III is near zero, so the direction of the axis is perpendicular to this one, i.e. it subtends an angle of 120°-90°=30° with the horizontal (because lead III subtends an angle of 120° with the horizontal).

Approximation methods

The direction of the electrical axis also can be estimated with approximation methods instead of these cumbersome but fairly accurate calculations (which are, luckily, performed by the ECG device). Such a method is the "rule of thumb", with which leads I and VF are surveyed. The direction of the main deflections determines the range (i.e. not the exact position) of the electrical axis.



Picture 32. Az elektromos főtengely irányának megbecsülése kötelező módszerekkel



Picture 33. Az elektromos főtengely tartományok

PATHOLOGIC ECG

Common disorders of impulse generation

This section presents the most common disorders of impulse generation, classifying them according to their origins. There are two main types:

- *Supraventricular disorders of impulse generation,* originating from the sinus node, the atrium or the area of the atrioventricular junction (so-called nodal disorders of impulse generation).
- *Ventricular disorders of impulse generation* originating from the conductive structures or muscles of the ventricles.

Supraventricular disorders of impulse generation

Extrasystole:

Supraventricular extrasystole can occur in healthy individuals as well – especially in smokers, or in case of sympathicotonia, e.g. as a result of regular caffeine intake – its pathologic form is mainly associated with pulmonary diseases and atrial hypertrophy. Besides increased sympathetic activity, bradycardia also contributes to the development of extrasystole. It is not a risk in itself, though extrasystoles can induce complex rhythm disorders, therefore the frequency of their occurrence and their accumulation requires treatment.

Atrial fibrillation:

Atrial fibrillation (AF) is the irregular, disorganized, asynchronous electric activity of the atrium, resulting in an atrial frequency of 350-600/minute. It develops due to the aggregation of several random atrial re-entries. According to some authors, at least six re-entry circuits are necessary for developing AF. It is always regarded as a pathologic rhythm disorder in any case. Factors contributing to its development: left ventricular hypertrophy, heart failure with stasis, ischemic heart disease, hyperthyroidism, old age. It creates so called f-waves with small amplitude in the leads representing the inferior region in the ECG curve. Fibrillation is classified into two groups; newly developed (within 48 hours) and chronic. The difference in duration is important in anti-arrhythmia therapy: the risk of the development of an atrial thrombus as a complication due to atrial fibrillation is extremely slight in the first 48 hours, thus cardioversion therapy does not involve the risk of thromboembolisation. Chronic atrial fibrillation can be recurrent, either paroxysmal or persistent; and permanent. Wells' criteria are the most suitable for defining the types of atrial fibrillation. In this classification the following types are included:

- *Type I:* discrete atrial beats with variable morphology, but the waves are separated by an isoelectric line
- *Type II:* various atrial beats with distinct morphology, but without isoelectric line between the waves.
- *Type III:* atrial complexes with discrete morphology and isoelectric segments are not detectable
- *Type IV:* mixed type, type III atrial fibrillation alternating with type I or type II segments.

Ventricular frequency varies with the conduction rate of f-waves, but it always results in irregular ventricular frequency. Atrial fibrillation with high ventricular frequency (HFAF) must also be mentioned here, which causes a sharp drop in minute volume and requires urgent intervention.

Ventricular disorders of impulse generation

Extrasystole:

It occurs even in healthy individuals almost daily (some people experience it, while others do not even perceive it), but it occurs more frequently under pathologic conditions. These are: acute myocardial infarction (including reperfusion following therapy), mitral prolapse, heart failure. From clinical aspect it is important to be aware of the fact that a significant proportion of the patients experiencing ventricular systole do not describe it as a stronger beat, but, perceiving the compensating pause after the extra beat, as a "skip" lasting for a shorter or a longer period.

Ventricular extrasystole must be considered pathologic if it is characterised by the following:

- Polymorphous
- Bizarre morphology
- Lown class 3, 4, 5
- QRS>160 ms
- Short coupling interval before QRS

In case of ventricular extrasystole the so-called "R-on-T" phenomenon also must be mentioned, which can result in rhythm disorders leading to clinical death (ventricular tachycardia, ventricular fibrillation). During this process the ventricular complex of the extrasystole is placed on the preceding T wave, thus affecting the preceding beat in its vulnerable phase, which leads to an increased risk of re-entry.

Ventricular tachycardia (VT):

Rhythmical ventricular activity with a frequency of 110–250/minute due to ventricular electric acceleration, which even can result in mechanic activity in case of constant minute volume (ventricular tachycardia with pulse), which is not sufficient, therefore it may involve hypotension and disorders in consciousness, but it is often unable to maintain circulation (pulseless ventricular tachycardia). In this latter case electrotherapy (defibrillation) is necessary as soon as possible. In case of VT with pulse cardioversion (electric or pharmaceutical) needs to be performed as soon as possible. In typical cases ventricular tachycardia originates from re-entry mechanisms which often develops in necrotic myocardium, therefore myocardial infarction is a common complication. It must be considered an emergency condition regardless of the presence or absence of mechanical activity accompanying the rhythm disorder, ventricular fibrillation often evolves as a complication. In classification general nomenclature is applied; thus there are sustained, non-sustained, monomorphous and polymorphous types.

Ventricular flutter:

An accelerated disorder of impulse generation caused by re-entry (as in case of atrial flutter), resulting in a ventricular frequency of 150–300/minute. It is not characterised by retrograde conduction to towards the atria, thus atrial frequency is usually within the normal range (60-100/minute), that is, atrioventricular dissociation is detected. The ventricular complexes generally have high amplitude, the deflection of individual beats may differ. This rhythm disorder results in low minute volume which leads to myocardial ischemia, often causing the ventricular fibrillation of the hypoxic myocardium.

Ventricular fibrillation:

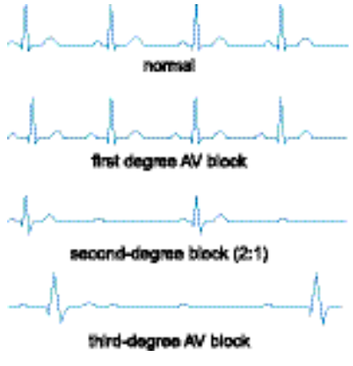
Rhythm disorder resulting in chaotic ventricular electrical activity interrupting pump function due to the failure of mechanical contractions, thus interrupting the maintaining of effective circulation. Arrest rhythm disorder, indicating immediate therapy (resuscitation). In this case efficient therapy means immediate electrical defibrillation. The ECG is characterised by chaotic, polymorphous ventricular complexes with no detectable isoelectric lines in the intervals between them. Concerning amplitude, its forms include low, medium and high-amplitude.

Common conduction disorders

Atrioventricular block

The degrees of the block affecting the atrioventricular node are the following:

- *First-degree AV block:* constant prolongation of PR interval, each P wave is followed by a ventricular complex.
- *Second-degree AV block:* both types (Wenkebach and Mobitz) can be detected:
  – Progressive prolongation of PR interval with the gradual decreasing of R-R interval, then one (and only one) P wave is not followed by QRS complex. The RR interval including the blocked P is longer than the preceding ones, but shorter than the sum of two consecutive RR intervals. Block rate may be fixed or inconstant, 3:2 and 4:3 are common.
  – In case of Mobitz type PR interval is within the normal range or prolonged (i.e. first-degree AV block is detected), then one (and only one) P wave is not followed by QRS complex. The RR interval including the blocked P is equal to the sum of two regular cycles.



Picture 34. Third-degree AV block

- *High-degree AV block:* Several P waves are not followed by QRS complexes consecutively, whereas the atrial impulse is conducted. Occasionally (at a high block rate) it may cause loss of consciousness (Morgagni-Adams-Stokes syndrome).
- *Third-degree AV block:* due to full block the activity of the atria and the ventricles become dissociated (AV dissociation), but only if an escape rhythm is able to control the ventricle. In the lack of this loss of consciousness or clinical death occurs.

High-degree and third-degree AV block often leads to haemodynamic unstability, therefore therapial intervention, which means the application of an artificial pacemaker, cannot be deferred.

Intraventricular conduction disorders

- Right Bundle Branch Block (RBBB): Unlike in physiological conditions, only the activation of the left ventricle takes place at the beginning of depolarisation, then the myocardium of the right ventricle is activated from the direction of the left ventricle. Therefore ventricular complexes are widened (QRS ≥ 120 ms), the period of positive deflections exceed that of negative deflections in leads V_{1-2} (QRS morphology: rSR', rsR', RSR', R, Rs), leads I, aVL and V_{5-6} are characterised by wide S waves. ST interval is usually isoelectric, but ST depression may occur in V_{1-2} and negative T waves also can be detected in $V_{1-2(-3)}$ (secondary repolarisation disorder).
- Left Bundle Branch Block (LBBB): ventricular complexes widen (QRS ≥ 120 ms), depolarisation is dominantly negative (rS,QS morphology), in right ventricular precordial leads (V_{1-2}), while depolarisation is accompanied mainly with positive deflection in leads directed at the left ventricle (I, aVL, V_{5-6}). Secondary repolarisation disorder also occurs, which is discordant with the main direction of the deflection of the ventricular complex: 1-2 mm ST depression can be detected in I, aVL, V_{5-6}; 3-5 mm ST elevation is detected in V_{1-3}. T wave deviations usually point in the same direction as the changing of the ST interval (they are concordant).
- Left anterior hemiblock (LAH) / left anterior fascicular block (LAFB): it is characterised by extreme left-axis deviation, that is, rS-morphology ventricular complex can be detected in II, III, aVF; while qR morphology is detected in I. The QRS complex is not widened, ST interval deviation usually is not detected.
- Left posterior hemiblock (LPH) / left posterior fascicular block (LAFB): It occurs in itself very infrequently. rS complexes are detected in I, aVL; qR complexes in II, III, aVF. St interval is usually isoelectric, but often negative T waves are detected in II, III, aVF.

30. Instrumental Examinations

BY PROF. PH.D. ZOLTÁN DÖBRÖNTE, KATALIN NÉMETH, PH.D. ATTILA KOVÁCS, KATALIN FUSZ

ENDOSCOPIC EXAMINATIONS

Endoscopy means inside inspection, a so-called examination with speculum, which provides an option for examination of the interior of body cavities from outside by the insertion of a special device, the endoscope.

The classification of endoscopic examinations

An endoscope can be inserted through a natural body opening (intraluminal endoscopy), or an artificially formed one (incision).

Through *intraluminal endoscopy* the gastrointestinal tract, the respiratory system, the ear drum (otoscope), the urinary tract, the cervix and the uterus can be examined. Mainly laparoscopy and in a broader sense some other procedures also can belong to the endoscopic examinations *through an incision. (Chart 1)*

Chart 1: The classification of endoscopic examinations

Intraluminal endoscopy

Endoscopy of alimentary tract
- oesophagi-gastro-duedonoscopy
- ERCP
- jejunoscopy
- balloon- enteroscopy
- protoscopy
- rectosigmoidoscopy
- colonoscopy
- capsule endoscopy

Endoscopy of uriniferous system
- urethrocystoscopy
- ureterenoscopy

Endoscopy of airway system
- laryngoscopy
- tracheobronchoscopy

Scopy of the ear (ear drum)
- otoscopy

Endoscopic examination of vagina and cervix
- colposcopy

Endoscopic examinations through incisions

Laparoscopy (it is mainly applied as an operative procedure at present)

Others
- mediastinoscopy
- angioscopy
- arthroscopy
- nephroscopy
- ventriculoscopy

The types of endoscopes

Endoscopic examinations can be performed by rigid and flexible endoscopes.

Flexible devices were introduced in the 1960s as fibre optic endoscopes and video endoscopes emerged in the 1980s. The development of flexible endoscopes made possible the complete examination of the whole of the upper gastrointestinal tract and the large intestine colon. The most important benefit of video endoscopes (Figure 1) is the more detailed image due to the bigger resolution as well as the much more concerted collaboration between the physician performing the procedure and the assistant. As they can see the endoscopic image simultaneously on the screen, the insertion of the endoscope as well as

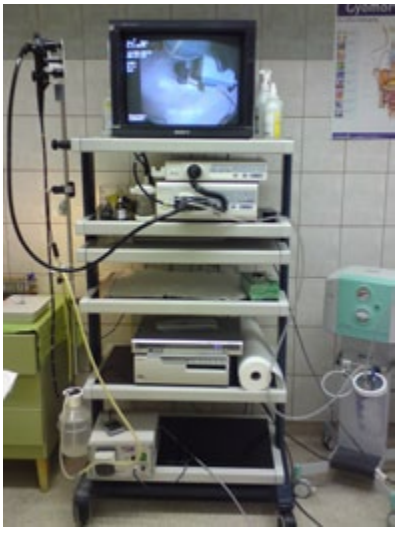


Figure 1
videoendoscopic examination unit

targeted tissue sampling and therapeutic medical treatments get more simple and complication-free. Moreover, video endoscopes expand the alternatives of image recording (CD, DVD, electronic archives), and in combination with other procedures (virtual chromo endoscopy) they enable to detect malignant lesions at an early stage. Due to the development and widespread use of video endoscopes the fibre optic endoscopy is losing its importance and is limited to bedside (mostly urgent) examinations. *Capsule endoscopy,* introduced in 2000, does not require endoscopic guidance, because the endoscopic image can be assessed by computer software on the basis of an electronic image series, recorded by the help of a chip placed in the swallowed capsule.

Diagnostic and therapeutic forms of endoscopic examinations

Diagnostic examinations

Each diagnostic examination is in itself primarily a diagnostic examination through the visual inspection of the image. Besides this the below mentioned diagnostic opportunities are given through special endoscopes or conventional endoscopes in combination with special devices.

Endoscopic ultrasound examination

It is primarily used for the determination of depth penetration and for staging classification of tumours in the oesophagus, stomach, rectum and large intestinal colon as well as for the differential diagnosis of submucous tumours, but it can also be applied for the detection of the small pancreas head tumour, furthermore for the staging of tumours of Vater-papilla, the pancreas head and distal choledochus portion and for the detection of small bile duct stones.

The latest endosonographic endoscopes are suitable for both ultrasound and endoscopic examinations. The radial ultrasound instruments are more beneficial if the target of the examination is exploratory diagnosis (Figure 2), while linear instruments make fine needle biopsy or diagnostic or therapeutic drainage of fluid content (e.g. cyst) even the drainage of the cyst possible. Thus the two methods can be complementary.

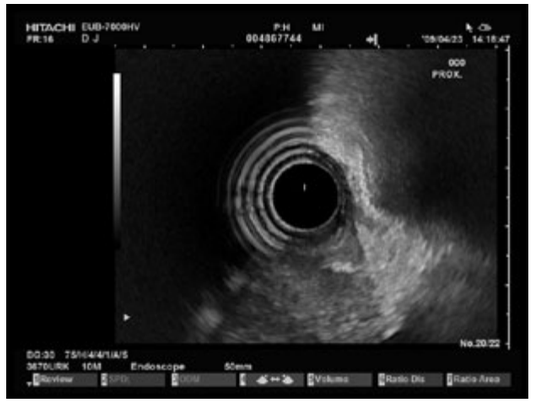


Figure 2 Endoscopic radial ultrasound image, extended oesophagi tumour

Ultrasound probes with radial scanning are also on the market; they can be inserted through the work canal of conventional endoscopes and are used primarily for the detection of the superficial mural structure in case of oesophagus- and bronchial coarctation.

Tissue sampling by biopsy forceps

- Histological examination: the excised tissue samples (biopsy specimens) must be put into a phial containing 8% formalin.
- For the detection of helicobacter pylori infection 2-2 biopsied samples must be taken from the mucosa of the stomach, the ant rum, the corpus by a sterile injection syringe and put into the appropriate solution depending on the method of the examination.

Loop biopsy: Removal of a bigger pathological mucosa portion or a polypoid lesion by a polypectomic loop for histological examination.

Cytological sampling: by abrasive method (brush cytology) or irrigation (exfoliative cytology).

Secretion suction: from the cholangio, the jejunum or bronchus by irrigation for bacteriological examination.

Laparoscopic targeted liver biopsy through Meghani-needle

Promoting methods for the detection of dysplastic and early malignant lesions

Chromo endoscopy.

The meta- or dysplastic and neoplastic mucosa detach by the help of *absorptive dye* inserted through special probes in the form of spray, whereas by the help of non- absorptive *contrast dye* the superficial pattern of the mucosa can be turned more contrastive.

Virtual chromo endoscopy.

It is capable of the stressed depiction of the superficial mucosa structure and vessel structure by the help of an optical filter or a computer software generating different wavelength light (Figure 3).

Auto fluorescent endoscopy.

Malignant or inflamed lesions are depicted in scarlet colour by the help of illuminant (light-source) capable of auto fluorescent imaging through the induction of the endogenous fluorophor tissue components.

Confocal laser endomicroscopy.

It provides a 1000 times magnified reconstructed layer image of the examined mucosa portion by the help of miniature laser scanner microscope built at the distal end of the video endoscope.

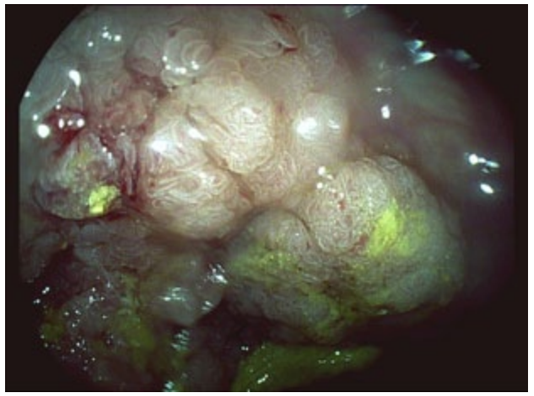


Figure 3 Virtual chromoendoscopy. Large colon polyp

Therapeutic alternatives

Removal of a foreign body

By the help of foreign body removers (forceps, nets, baskets) a sharp object (e.g. razor blade) can be removed safely only pulled into a tube placed at the end of the endoscope, and thus protecting it.

Endoscopic control of bleeding

Applied methods in case of bleeding of non-variceal origin

Injection method.

Substance having an effect by vasoconstriction, compression or thrombus formation must be injected around the bleeding vessel through a sclerotic needle. It can be diluted adrenalin (1:10000), sclerotic substance (e.g. polidocanol, absolute alcohol), thrombin or fibrin glue.

Method based on heat effect (thermal, coagulant)

- Contact method: electrocoagulation
- Non-contact method: argon plasma coagulation, Nd-YAG-laser coagulation

See video spot 1 –*http://tamop.etk.pte.hu/apolastan/english.html*

Mechanical blood staunch

- clip placement
- endoloop (treatment of bleeding after polypectomy)

See video spot 2 – *http://tamop.etk.pte.hu/apolastan/english.html*

Applied methods in case of bleeding of varicosity origin

Endoscopic sclerotising:

Polidocanol, ethanolamine or sodium-tetradecylsulphat are injected by the help of a sclerotising needle inserted intra- or paravariceally through the work canal of the endoscope for the obliteration of the bleeding varice in the course of the blood staunching procedure.

Rubber ring ligation:

Haemorrhoid or oesopgagus varice portion can be strangulated after sucking it into a transparent cylinder placed at the end of the endoscope by the release of the rubber ring.

See video spot 3 – *http://tamop.etk.pte.hu/apolastan/english.html*

Tissue gluing:

Primarily varicose vein bleeding in the stomach (in the fornix region) can be treated efficiently by injecting cyanoacrylates (Histoacryl).

Endoscopic polypectomy:

The peduncle of the polyp must be caught by an isolated target loop, and then cut by high frequency current.

See video spot 4 – *http://tamop.etk.pte.hu/apolastan/english.html*

Endoscopic mucosa resection and endoscopic sub mucosal dissection

It is a method applied for the treatment preventing carcinogenic conditions and certain cases of early-stage cancers. To start with, the sub mucosa and the muscular layer must be segregated under the lesion by injection infiltration. Then *mucosa resection* is performed by polypectomic loop via electro resection. *Sub mucosal dissection* can be performed by a specially formed electro cautery knife by the help of which the mural layers above the muscle layer can be removed continuously.

Endoscopic lumen dilatation

This method is mostly suitable for the treatment of the benign narrowing (stenosis) in the oesophagus and biliary duct, in some cases in the stomach, duodenum, rectum, airways and urinary tract, in case of malignant stenosis for ensuring the insertion of endoprosthesis. Two types are known: probe and balloon dilatation.

Implantation of endoprosthesis

It can be performed for palliative treatment of inoperable malign oesophagus-, cardia-, duodenum-, rectum-, colon-, biliary tract and airway stenosis, besides these it can be used for transitionally benign biliary tract or pancreas tract stenosis, furthermore in case of anastomosis, post-operative bile leakage.

Two types are known: plastic (Figure 4) and self-dilating metal endoprosthesis.

Endoscopic papillectomy

It means the adenoma electro resection of the Vater-papilla by a polypectomic loop in one or several parts.

Endoscopic sphincterotomy (EST)

The joint bile tract, in some cases the sphincter, the distal intraduodenal portion of the pancreas tract is cut by high fre-

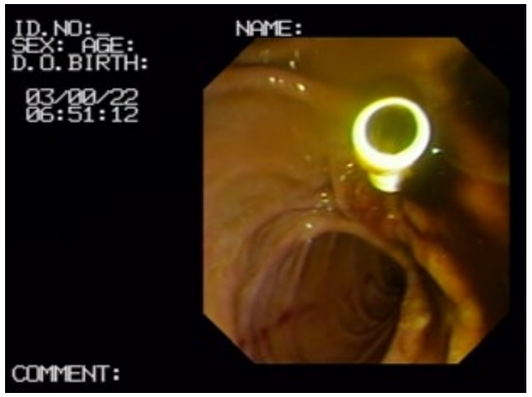


Figure 4 The duenoscopic image of plastic bile duct endoprothesis

quency current with the help of a catheter applied with cutting wire, sometimes needle papillotom, in case of ERCP.

See video spot 5 – *http://tamop.etk.pte.hu/apolastan/english.html*

Endoscopic stone extraction

It is a method for removing biliary tract stones (pulling them into the duodenum) through endoscopic sphincterotomical lumen or by the help of a balloon catheter, moreover the extraction of urethral calculus in case of cystoscopy.

See video spot 6 – *http://tamop.etk.pte.hu/apolastan/english.html*

Endoscopic lithotripsy

It is a method for cutting the stones into pieces because they cannot be extracted endoscopically either because of the size of the stone or because of stenosis.

Types

- Mechanical lithotripsy (by a Domia catheter built from special, strong steel threads, in metal casing).
- Intraductal electro hydraulic lithotripsy
- Laser lithotripsy

Endoscopic pancreas pseudo cyst puncture and drainage

It can be performed directly (in case of a cyst making the stomach and duodenum mural convex) or by endoscopic ultrasound guidance. A plastic pigtail shaped drain can be inserted after electocauteryl fistulotomy.

Insertion of a nasobiliar probe

A plastic probe with flexed end (pigtail) is routed through the endoscopic sphincterotomic lumen in the endoscope work canal to the biliary tract.

By the help of it bacterial bile cultivation is possible as well as insertion of antibiotics, stone solvent, and contrast medium.

Endoscopic tissue destruction

It can be used in case of malignant stenosis as well as for complementary treatment of a premalignant condition or after the endoscopic resection of early stage cancer.

Methods of this procedure:

- Photocoagulation by Nd-YAG laser
  - Argon plasma coagulation
  - Radiofrequency ablation
  - Photodynamic treatment

Colonoscopic decompression by insertion of draining probe

Endoscopic means of feeding

- Percutan endoscopic gastronomy (PEG)
  - pull technique
  - push technique
  - direct stab incision
- Percutan endoscopic jejunostomia (PEJ)
  - feeding probe inserted through PEG
  - probe inserted directly into the jejunum (by a technique similar to PEG)

Other endoscopic therapeutic methods

- *Endoscopic closure of fistula:* Closing the small tracheo- or broncho-oesophageal fistula by cyanoacrylates (Histoacryl) inserted by a Teflon probe.
- *Endoscopic myotomy:* for the treatment of Zenker diverticulum – by the help of argon plasma coagulator or electrocauter.
- *Endoscopic fundoplicatio-* for treatment of gastro-oesophageal reflux.

General guidelines for indication of endoscopic examinations

The lack of the patient's co-operation serves as a general contra-indication of examinations. Before each examination risk factors, contraindications, potential complications and the expected diagnostic and therapeutic gains should be considered. Examination must be prepared so that in case of need operative treatment could be performed concurrently. For this it is necessary to know about the blood count, INR, PTI, blood type, medications taken and a potential pacemaker or other electronic implants.

Types of endoscopic procedures

Oesophagi-gastro-duodenoscopia

It is performed with a flexible, forward-viewing optic instrument (Figure 5). It is a method suitable for the examination of the complete oesophagus and the stomach, and the shorter or longer portions of the duodenum (Figure 6). It is highly recommended to examine all the three regions unrelated to indication. A side-viewing duodenoscope is required for the reliable detection of the Vater-papilla in the duodenum.

Figure 5 Oesophhagi-gastro-duedonoscope (videoendoscope)

The most relevant aspects of the examination:

- It must be performed after fasting; the patient is not allowed to have solid food 6 hours, nor liquid 4 hours before the examination.
- Medication preparation: pharynx anaesthesia. Sedation (midazolam) should be considered individually.
- The patient must be located in a lateral position on the left side with his head bent forward in the direction of the chest.
- Careful inspection is needed during both downward and upward passage.
- Before the withdrawal of the endoscope from the stomach, the air and gastric juice inside must be removed with the use of suction as much as possible.

The indications of the examination:

- Emergency indications: acute gastrointestinal bleeding, swallowing foreign bodies
- Symptoms of the diseases in the upper gastrointestinal tract
- Difficulties of deglutition /act of swallowing, painful swallowing, retrosternal or upper abdomen pain, acid
- Regurgitation, pyrosis, epigastrial discomfort feeling, persistent nausea, vomiting
- Tumour detection in case of general symptoms or detected metastasis
- Control examination: assessing the efficiency of treatment, follow-up examination because of a precancerous condition
- Others: occult blood in faeces, anaemia iron deficiency, suspicion of cirrhosis of the liver (for the examination of gastro oesophageal varicosity, portal hypertensive gastropathy)
- Malabsorption (deep duodenum biopsy).

Contraindications of the examination: suspicion of perforation, aorta aneurysm, fresh myocardial infarct.

Potential complications: perforation, aspiration (mainly in case of acute gastrointestinal bleeding).

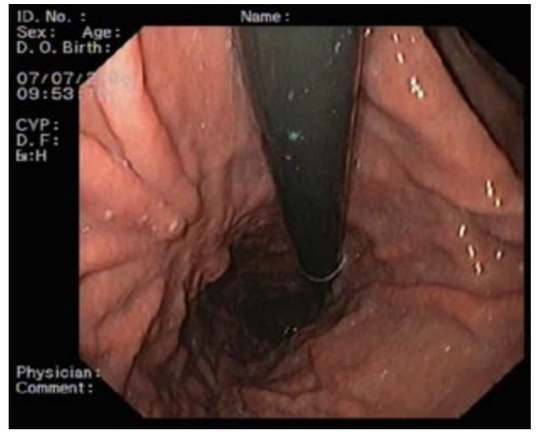


Figure 6 Gastroscopic Image. Stomach fornix-and cardia region and the endoscope itself can be seen in inversion

Jejunoscopy (proximal enteroscopy)

The applied device is a 190-cm long flexible, forward-viewing endoscope by which the complete duodenum, and on average a 70 cm (30–120cm) portion of the jejunum can be examined (Figure 7). The stomach and the oesophagus can be inspected at the same time.

The most important aspects of the examination

- They are mostly equivalent to the above mentioned regarding the oesophagi-gastro-duodenoscopy. The exceptions and the special aspects are the following.
- In the course of medication preparation besides the pharynx anaesthesia sedoanalgesia (midazolam+pethidin) must be applied.
- The endoscope must be inserted slowly, pushing and withdrawing it step by step dosing little air.
- Reaching the Treitz ligament the device must be conducted further on while the patient is lying on his right side.
- If it is necessary the loop formation of the endoscope can be reduced by axial pressure – which does not nar-

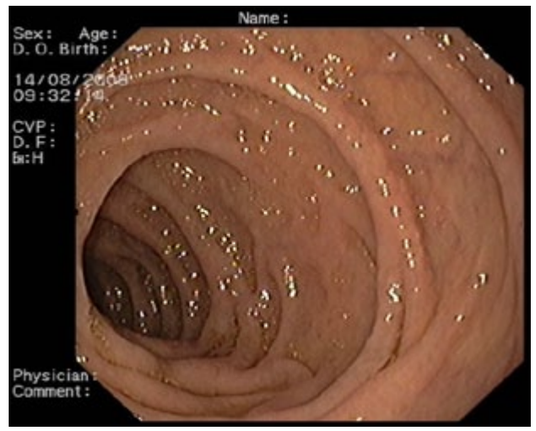


Figure 7 Jejunoscopic Image. Valves of Kerkring of small intestine. cap 330

row the lumen and by this the visual field- from the direction of the stomach. To prevent the loop formation in the stomach an "overtube" can be used which must be put onto the endoscope before its insertion. The position of the "overtube" should be checked through X-ray.
- Inspection in detail is performed during the withdrawal of the endoscope.

The indications of the examination:
- occult or manifest gastrointestinal bleeding of undetermined origin
- isolating diagnosis of small intestine stenosis (narrowing)
- Polyposis syndromes
- suspicion of small intestine tumour.

Contraindication and potential complications are the same as in the case of oesophagi-gastro-duodenoscopy. In case of "overtube" application besides this injury of pharynx, Mallory-Weiss lesion and pancreatitis may occur.

Balloon enteroscopy

It is a combined examination from oral and anal direction which provides opportunity for the inspection of the complete small intestine in some cases.The double-balloon method was introduced in 2001, the single-balloon technique in 2007. The double-balloon enteroscope is inserted with an overtube on it.

In the case of endoscopes as well as double-balloon enteroscopes the tube is applied with an inflatable balloon.

The most important aspects of the examination:
- It can be performed after 12-hour fasting and bowel cleansing (colonoscopic) preparation.
- It is recommended to perform it in deep sedation (Propofol) or in anaesthesia which requires the participation of an anaesthetist.
- During double-balloon enteroscopy the tube is delivered to the stomach after inserting the endoscope into the stomach, then the endoscope is inserted into the descendent duedenum branch while the assistant fixes the tube manually. After disposal the balloon of the endoscope is inflated, then also the tube is delivered to the duodenum, and its balloon is inflated as well. Afterwards the endoscope is straightened withdrawing it together with the tube. Then the enteroscope and the tube are delivered forward by alternate inflation and deflation of the two balloons, then both balloons in inflated condition are withdrawn, by this straightening the formed loops as far as possible and pulling the small intestine onto the endoscope. In case of an examination from the anal direction the delivery in the small intestine takes place in the same way.
- *In case of single-balloon enteroscopy* the balloon is disposed at the distal end of the flexible silicone 140-cm long overtube attachable to the enteroscope. The technique of the examination is only different from the double-balloon enteroscopy in that respect that the device in the small intestine can be fixed by 180 degree angling of the end of the endoscope instead of the inflation of the balloon at the end of the device during the delivery of the endoscope meanwhile the tube can be delivered further on without stretching the bowel wall. It is the assistant's job to attach and fix the balloons, in case of double-balloon enteroscopy to put the overtube on the endoscope and to keep it in a stretched condition in the course of its delivery to the intestinal tract during the examination, furthermore to inflate the appropriate balloon by pressing the automatic air dose button when it is indicated by the physician.

The indications of the examination
- in the course of capsule enteroscopy or image procedure at places which cannot be reached by a jejunoscope
- endoscopic treatment or histological examination of the detected lesion (abnormality)
- the examination of the large intestine in case of incomplete colonoscopy
- ERCP Roux-Y-in case of patients operated with anastomosis.

Contraindications of examination: cardiorespiratory insufficiency, pregnancy, abdominal coalescence caused by previous operations, anticoagulant treatment.

Potential complications: temporary abdominal pain, pancreatitis, bleeding, perforation.

Capsule endoscopy

The examination of the small intestine, which is accessible with more difficulty by conventional endoscope technique, is the primary area of its application, but a special capsule is also developed for the examination of the oesophagus and the large intestine. The main point of the procedure is that a telemetric system built in a capsule swallowed by the patient takes a set of digital pictures while advancing in the intestinal tract and transmits the data to the data collector attached at the waist of the patient and an endoscopist (a special physician adept in endoscopy) assesses the pictures by the help of computer software. The diagnostic accuracy of the method is far behind that of the direct endoscopic examinations, it is significantly more expensive and it does not make tissue sampling and operative therapeutic treatment possible.

Chart 2: The assignment of the location of sensors on the stomach wall in case of small intestinal capsule endoscopy

1. The edge (periphery) of the costal arch in the medioclavicular line
2. Processus xyphoideus
3. Right hypogastrium laterally
4. Navel
5. Left costal arch periphery in the medioclavicular line
6. Left hypogastrium laterally
7. Right inguinal region
8. Left inguinal region

Figure 8 Small intestinal endoscopic capsule

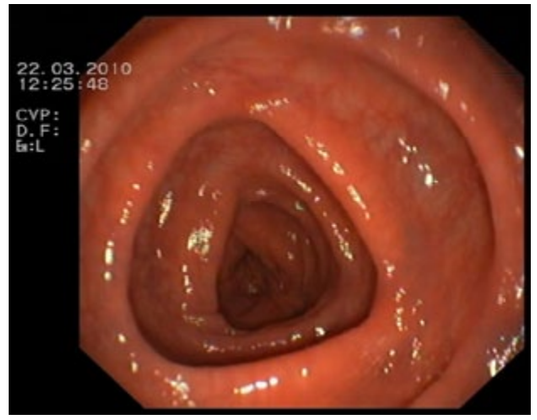


Figure 10 Colonoscopic image of colon transversum cap 002

The most relevant aspects of the examination

The patient's data must be recorded in the computer before the examination. The patient drinks a glass of water containing simeticone (Espumisan, Sab simplex), then the sensors must be fixed on the previously assigned places of the patient's abdomen (Chart 2). The belt must be placed on the patient's waist, and then the receptors and the battery must be put in the pockets of the belt.

The wires of the receptors must be attached to a recording unit, the latter to the battery. The capsule (Figure 8) must be taken out of the blister containing the magnet, which is activated by it. The patient should take the capsule drinking a glass of water, then he must drink another 2 glasses of water. In case of slowed down emptying of bowels procineticum (metoclopramide) must be given to promote the advance of the capsule. The patient can drink for the first time 4 hours and he can eat 5 hours later, and he should take his potential medicine at this time; otherwise he is allowed to follow his normal daily routine during the examination.

8 hours later the recorder, the sensor, and the belt can be removed from the patient. The pictures must be downloaded attaching the recorder to the computer (about 25 minutes).

The patient empties the capsule in a spontaneous way. The patient's attention must be drawn to announce it if he cannot observe it. In this case it can be made clear by an X-ray examination if it is blocked in the intestinal canal.

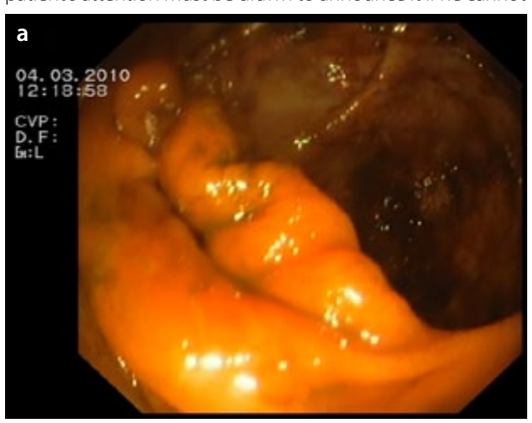
The indications of the capsule enteroscopy:
- bleeding of undetermined origin or anaemia,
- polyposis of the small intestine,
- the suspicion of enteropathy caused by non-steroid anti-inflammatory,
- small intestine localization of Crohn disease.

Contraindications of the examination: the suspicion of intestinal tract obstruction, pace maker and built-in defibrillator.

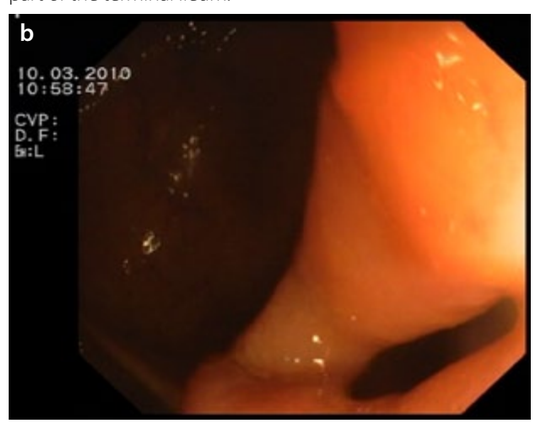
Potential complication: the capsule getting stuck.

Colonoscopy

It is a procedure of examination performed by a flexible, forward-viewing colonoscope which has been applied since 1971 (Figures 9 and 10), and which provides visual inspection for the entire large intestine as well as observation of the short part of the terminal ileum.



9/a Figure The colonoscopic image of coecum



9/b Figure The orifice of ileocecil valve. cap 153

The most relevant practical aspects of the examination:

The examination is recommended to be carried out after bowel cleansing preparation in sedoanalgetic premedication (mindazolam / Dormicum / + propofol / Diprivan /).

- Before inserting the endoscope the sphincter must be spread with silicon oil. The patient is in a lying position on his left side when the colonoscope is advanced to the flexure lineal, then on his back when it is passed further to the coecum.
- The endoscope can be guided further on only providing the lumen is visible and free.
- By compression on the left abdomen the formation of the sigma loop, by pressing the medium part the ptosis of the colon transversum can be prevented.
- The tension of the bowel wall and the patient's feeling of discomfort must be eased by removing the air before the end of the examination.

The indications of the examination:

- symptoms of large intestinal diseases: bloody faeces, occult bleeding, anaemia of iron deficiency origin
- a change in defecation habits, abdominal pain, tenesmus, chronic diarrhoea
- tumour detection in case of general symptoms or detected metastasis
- estimation of the activation and expansion of colitis ulcerosa and Crohn disease
- patients with inherent susceptibility to cancer (incidence of polyposis syndrome, carcioma of large intestine- and rectum or polyp in case of direct descendants)
- the serial examination of residents over 50 (screening tests) every 10 years (it is a procedure which has not been introduced in Hungary yet).

Contraindications of the examination: for three weeks after acute myocardial infarct, cardiorespiratory deficiency, acute toxic megacolon.

Potential complications: perforation, temporary bacteraemia (fever), so vitium, artificial valve, and in case of immune suppressed condition antibiotic prophylaxis must be applied.

Protoscopy

It is a method for the examination of the anal canal by the help of short, rigid – disposable or non-disposable – device.

Rectosigmoideoscopy

Rigid recto scope (rectosigmoideoscope): 25 cm long device which is primarily used for endoscopic surgical treatments nowadays.

Flexible sigmoideoscope: 60 cm long device for the examination of the rectum, the sigma and perhaps the examination of the colon descendens.

The main practical aspects of the examination

- 1-2 phosphosodic lavage before the examination (using lukewarm water containing 125 ml 16% sodium–biophosphate and 6% sodium-phosphate), after which the patient must not eat any food.
- Laxative cannot be given as part of the preparation.
- The examination is performed while the patient is in a lying position on his left side.
- The sphincter must be spread with silicone oil before inserting the endoscope.

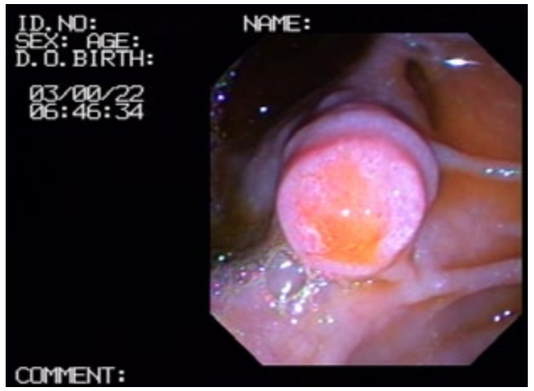


Figure 11 Vater-papilla with juxtapapillaris duodenum diverticulum Duodenoscopic image cap 219

Endoscopic retrograde cholangiopancreatography (ERCP)

It is an examination by a flexible side-viewing duodenoscope, which was introduced in 1968 and it makes the visualization of the biliary system (biliary duct, gallbladder) and the pancreas duct possible. In 98% of the cases the Vater-papilla can be cannulated (Figure 11), but the visualization of the required duct is successful only in 90% even when performed by an experienced physician. At present most examinations are combined with operative treatments of the bile- or pancreas duct, the first step of which is endoscopic sphincterotomy (EST), as the incision performed by cutting the sphincter makes possible the insertion of the devices required for further therapeutic treatments. The first ESTs in Germany and Japan were announced almost at the same time, in Hungary the first treatment was performed in 1977.

The most relevant practical aspects of the examination:

- The examination must always be performed with full knowledge of the parameters of blood group and blood clotting (the time of protrombine (INR), the number of thrombocytes, PTI), as in most cases ERCP is followed by endoscopic sphincterotomy.
- The staff performing the examination must wear lead aprons during the examination.
- The patient must be placed in a lateral position on his left side on the X ray-imaging treatment table which is suitable for transillumination and imaging at the same time. Thus the insertion of the endoscope to the descending colon of the duodenum takes place and when it reaches it, the patient must be turned onto his abdomen.
- Water soluble 60% contrast substance is used, but minor stones can be detected more precisely by contrast substances with less concentration. In case of known hypersensitivity non-ionic contrast substance should be used.
- After the cannulation of the Vater-papilla, it must be checked on the image intensifying screen of the X-ray by a little contrast substance injected by low pressure if the duct being detected is saturated or not. For the saturation of the pancreas duct 3-4 ml contrast substance is sufficient; it can be saturated as long as the lateral branches appear. The bile duct system can be saturated until the saturation of the intrahepatic branch system. In case of dilated gall ducts, sometimes it can only be achieved by tilting the treatment table (putting the patient into Trendelenburg position). The gallbladder occasionally is saturated only in lateral position on the right side. After the removal of the endoscope it is practical to take pictures in supine position, as well.
- After the examination, observation for at least 24 hours is necessary The serum amylase must be checked routinely, the number of white blood cells depending on the complaints and previous results or in case of need the patient must temporarily be made to fast, be infused, and preventive or curative antibiotic (according to the above mentioned in sub chapters 6.3.1.2.) treatment must be provided.

The indications of ERCP

1. The laboratory, imaging examinational, or clinical signs of *bile duct disease:*
   - jaundice: high serum alkalotic phosphatise, y-GT level, diluted bile ducts (ultrasound examination)
   - complications of bile operation: choleresis, stones left behind
2. *Pancreatis*
   - acute biliar pancreatitis
   - chronic relapsing pancreatitis
   - the suspicion of pancreas tumour, in cases when it cannot be cleared by other imaging examinations unambiguously.
3. *Planned endoscopic therapeutic treatment*

The contraindications of ERCP

The absolute contraindications are the same as those of oesophagi-gastro-duodenoscopy.

Potential complications: acute pancreatitis, acute cholangitis, pancreatic abscess (infection of pseudo cyst saturated by contrast substance), temporary hyperamylasaemia without pancreatitis (in 35%–70% of cases). Complications connected with repeated unsuccessful cannulation (inserting cannulas) attempts, it can happen without saturating duct contrast saturation because of the trauma of the Vater –papilla and the subsequent oedema.

Bronchoscopy

The endoscopic examination of the tracheo-bronchial system can be performed by rigid and flexible devices. In case of the removal of a larger foreign body or severe bleeding the treatment by a rigid bronchoscope is preferred, furthermore in infancy and childhood, when accurate visibility can be ensured only by a rigid device because of the narrow bronchus diameter. Special diagnostic and therapeutic possibility is secretion suction, endobronchial actinotherapy, as well as the local injection of medication.

The most relevant practical aspects of the examination:

- The functional respiratory test and ECG examination for orientation is recommended before the examination.
- Bronchoscopy can be performed by a rigid device in anaesthesia (narcosis) while using a flexible device local anaesthesia is sufficient. Sedative medication can be considered individually.
- Two special nurses are required to co-operate in the examination, one of them is in charge of patient observation, the control of his vital functions.
- The patient must be provided oxygen through a nasal tube during the examination.
- During the examination an urge to cough can occur.

The indications of the examination

- haemoptoe of undetermined origin
- chronic cough of undetermined origin
- stridor
- recurrent bronchitis and pneumonia
- a planned operation because of the oesophageal tumour, to exclude the tumour penetration in the airways
- timorous or granulomatosic lesion (biopsy, abrasive or exfoliative)
- cytology, endobronchial sonography, transbronchial fine needle biopsy), to detect the condition of the bronchi before the operation of the lungs because of tumour
- bacteriological sampling (by bronchus irrigation)
- aspirated foreign body
- blood staunching
- secretion suction
- the dilatation of airway narrowing (stenosis) by balloons, insertion of endoprothesis
- the closure of fistula
- local administration of medication
- the palliative (after loading) treatment of inoperable lung tumour (pulmonic tumour).

Contraindications of the examination: cardio respiratory deficiency, pulmonic hypertension, aorta aneurysm, the suspicion of the increase of brain pressure.

Potential complications: hypoxia, laryngeal and bronchospasms, bleeding. After the examination temporary hoarseness and blood expectoration can occur.

Cytoscopy (urethrocystoscopy)

This method has been applied since 1878 (M. Nitze). The urethrocystoscope is a rigid endoscope inserted through a metal tube of 8–24 Ch (3–8mm) diameter, which makes the observation of the urethra and urinary bladder possible. The operational cystoscope with a bigger diameter offers an option to break up the urine stones, to remove bladder tumour, to perform prostate resection. It can be combined with uretero catheteterization (to avoid ob-

struction, to insert double "pig tail" stent, the extraction of urethral stones by Domia-basket or for the purpose of pushing it in to the pyelon, or for the injection of X-ray contrast material in case of retrograde pyelography).

A special device, a much thinner and longer flexible or rigid *ureterorenoscope* serves the diagnostic and therapeutic examination of the urethra and the renal pelvis.

The most relevant practical aspects of the examination:

- sterile (operative) conditions should be ensured for the cystoscopy because of the risk of infection
- the examination is performed in case of male patients in local anaesthesia (using lubricant anaesthetic gel) while in case of female patients without it.
- In case of biopsy, urethra catheterization or therapeutic treatment -sedoanaelgesic medication is recommended- when a rigid endoscope is applied.
- The rigid cystoscope must be introduced by obturator, then after the withdrawal of it, the optical devices must be inserted in its place.
- Bladder irrigation (washing) must be performed through the adjugate (adjacent tube) of the cystoscope- for ensuring clear visibility- then the bladder must be filled with 150 ml sterile liquid (physiological saltine or distilled water). The examination is performed at different filling phases. It is recommended to let the liquid out before the withdrawal of the cystoscope.
- Optical devices with different viewing serve the targeted examination of certain areas (30º standard, 0º urinal duct, 70º prostate, 120–170º bladder neck).
- The patient must be made to lie in Trendelenburg position and the bladder must be pressed over the symphysis in case of the observation of the bladder.

The indications of the examination:

- haematuria
- suspicion of bladder tumour
- suspicion of urethra obstruction
- recurrent urinary duct inflammations
- incontinence
- to reveal developmental anomalies

Potential complications: bleeding caused by injury, scarring, inflammation.

Laparoscopy

It is an examination performed by a rigid endoscope inserted through an abdominal incision which gives an opportunity to observe and give operative treatment of the liver, peritoneal cavity and the true pelvis. As a diagnostic treatment it was introduced by Jacobeus in1910. The first operation by laparoscope was performed by Semm in1980. Since then it has become the primary device for several abdominal and true pelvis operations, meanwhile as a diagnostic method it has been neglected due to the expansion of modern imaging procedures. Accordingly, the procedure performed earlier by an internist gastroenterologist is applied nowadays by surgeons and gynaecologists as an operative treatment.

Diagnostic laparoscopy can be performed under local anaesthesia while laparoscopic operations only under anaesthetic. The endoscopic treatment is preceded by preparation of pneumoperitoneum by carbon dioxide gas administered through a special needle (Veress-needle). The observation and the operation can be followed due to the video endoscopic technique on the screen by the assistant.

The most relevant practical aspects of the examination

- The examination can be performed only with the knowledge of blood group and blood clotting parameters (prothrombine time (INR), the number of (platelets) thrombocytes, PTI).
- The patient cannot be given anything orally in the previous 8 hours, before the examination a cleansing lavage must be given and the patient must be ensured to empty his bladder.
- The hair on the patient's stomach must be shaved before the examination.
- The patient must be made to lie on his back with his hands fixed on the operating table, and the entire surface of the stomach must be disinfected.

Over the navel and on the left 2-3 centimetres away from the targeted location of the insertion, the area must be isolated by a sterile cloth, then the skin and tissues under it including the mural peritoneum, as well, must be spread with 1% Lidocain solution.

- After performing a small incision, the Veress-needle is inserted, through which as much CO_2 gas is infiltrated in the abdominal cavity as it is needed for the accurate visual field (1,5-3 1itres). After the removal of the Veress-needle, in its place the trocar is inserted in the trocar shaft, then after the removal of the trocar the laparoscope is guided into the trocar shaft.
- Targeted biopsy can be performed on the basis of pathological lesions obtained by the help of biopsy retractor inserted through the work canal of the scope or by a biopsy retractor inserted through a trocar shaft from a different incision. Targeted liver biopsy can be performed by Menghini-needle.
- After the removal of the laparoscope the gas in the abdominal cavity is let out through the trocar shaft.
- After the removal of the trocar shaft the hole must be closed by 2-3 stitches. The location of the second potential insertion must be applied by a clasp.
- After the examination 24- hour close observation is needed.

The indications of the diagnostic laparoscopy

- abdominal tumour staging
- ascitis of undetermined origin
- abdominal pain of undetermined origin (e.g. adhaesio)
- abdominal trauma
- suspicion of acute abdominal disease of undetermined origin.

Contraindications:

- *Absolute contraindications:* blood staunch disorder, cardiorespiratory deficiency, acute myocardial infarction (for 3 weeks), bacterial peritonitis, abdominal wall infection.
- Relative contraindications: previous abdominal operation, extreme obesity, large abdominal wall hernia, large hiatus hernia.

The methods of medication preparation of endoscopic examinations

Local anaesthesia

The anaesthesia of the pharynx

It facilitates the passing of the endoscope and reduces the patient's feeling of discomfort in the course of the examinations of the upper portion of the alimentary tract (oesophagi-gastro-duodenoscopy, ERCP, jejunoscopy), its routine application is recommended for this reason – the insufflations of 10% Lidocain spray 2 or 3 times directed onto the back pharynx wall. The anaesthesia of the larynx must be avoided not to exclude the cough reflex by doing so. (This the reason why it is not practical to tell the patient to say "aaah", as usual, before inhaling the spray.) Pharynx anaesthesia must always be used before the sedative premedication. In case of lidocain hypersensitivity the examination can be performed without pharynx anaesthesia. It is not to be used when patients are close to shock, have upper alimentary canal bleeding or they are elderly and in a poor state of health.

The anaesthesia of anal sphincter

Before the endoscopic examination of the rectum and the colon – in case of sensitivity or pain of the anal canal for some reason – gel containing lidocain can be used to decrease the discomfort during the insertion of the endoscope; however, its routine application seems to be unnecessary.

Abdominal wall anaesthesia

The location of the insertion of the probe or trocar must be anesthetized by 10–15 ml 1% or 2–5 ml 2% lidocain injection before percutan endoscopic gastrostomy (PEG), percutan endoscopic jejunostomy (PEJ) and laparoscopy.

The anaesthesia of the larynx

It is recommended to use routinely before bronchoscopy. It is performed by using 10–15% lidocain (Lidocin) injected by larynx syringe by the help of laryngoscope.

The anaesthesia of urethra

1ml lubricant, disinfecting and anaesthetic gel (Instillagel) must be administered into the urethra before the cystoscopic examination of male patients.

Sedative and analgesic premedication

The indication and target of premedication

The oesophagi-gastro-duodenoscopy from among the endoscopic examinations, the flexible sigmoideoscopy and cystoscopy can be carried out without sedative and analgesic preparation; these cases require individual decision depending on the patient's personality. The appropriate psychological preparation, however, cannot be ignored in this case. Bronchoscopy, colonoscopy, enteroscopy, ERCP and the examinations combined with therapeutic treatments, however, in most cases cannot be tolerated without premedication.

The target of the premedication, on the one hand, is to ensure the patient's satisfaction, which seems to be of special importance – for the patients, probably, in need of control, on the other hand – for the improvement of the circumstances of the examination.

The complications and preconditions of sedoanalgesic premedication

As *complications of sedation* respiration arrest, airway obstruction, vomiting, aspiration, circulatory depression, furthermore allergic and anaphylactic reactions can emerge. For this reason the preconditions of intravenous, sedoanalgesic premedication are the following:

- Continual attention to veins (vein cannula-branul) during the examination and the observation
- Benzodiazepine and opiate antagonists (flumazenil and naloxon) available
- cardiopulmonal reanimation devices (AMBU-respirator, laryngoscope, tube for intubation), and the basic medication for resuscitation (Tonogen, intravenous steroid, calcium, Lidocain, atropine etc.)
- Experience in ensuring patent airways, intubation and methods of resuscitation
- O_2 and aspirator connecting options
- Pulsoxymetric monitoring
- The patient's life functions must be continuously followed by a trained endoscopic assistant experienced in cardiopulmonary resuscitation.
- 8. options for defibrillation.

The most common medication and dosages used for sedative and analgesic preparation

- ***Benzodiazepines –*** midazolam (Dormicum) (no further explanation?)
- ***Propofol (Diprivan)*** Its advantage compared to benzodiazepines, such as midazolam is that it is shorter acting and works quickly. Its drawback is the narrow therapeutic dosage domain, furthermore it lacks antidote, it may cause besides respiratory depression, a fall in blood pressure and bradycardia and it is significantly more expensive. Its application in Hungary is still bound to the presence of an anaesthetist. Its medication dosage 0,5mg/kg 1–2 minutes intravenously, dosage for maintenance 10–20mg/30–60 seconds, on the basis of the patient's reactions it should be administered in small doses or by perfusor. In case of the signs of respiratory depression dosing oxygen should be combined with artificial respiration.
- ***Opioids – pethidin (Dolorgan, Fenthanyl)*** They serve analgesic supplementary sedation. They are indispensable in case of extremely painful treatments (dilatation of oesophagus, stent of oesophagus, PEG, PEJ, bronchoscopy, colonoscopy). The most common is pethidin (Dolorgan) for endoscopic premedication; its dosage is 50–100mg

intravenously before the examination. The antidote of opioids is naloxon, its initial dose is 00.1–0.4mg, which can be repeated in case of need at 2–3 minute intervals.

Antibiotic prophylaxis before endoscopic examinations

There has been a significant change in the guidelines of antibiotic prophylaxis in the past 2-3 years. Thus, in order to prevent infective endocarditis, endoscopic examination involves antibiotic prophylaxis indication today only in the case of infection in the gastrointestinal tract in which enterococci involvement can be assumed (e.g. cholangitis), in the case of the following cardiac status:

- artificial valve
- previous infective endocarditis
- patient with cardio transplantation having valve defects
- congenital heart diseases.

To prevent other infections:

Antibiotic prophylaxis is recommended in the following cases

- in certain cases of ERCP:
  - pancreas cyst or pseudo cyst
  - hilaris biliary duct stricture, primary sclerosing cholangitis (PSC) when the perfect solution of the obstruction has not been possible
  - bile duct intervention in case of a patient with transplanted liver
- PEG/PEJ- because of wound infection
- Fine needle aspiration by endoscopic ultrasound for cytological sampling from cyst or pseudocyst- because of the risk of septic complications
- In the case of gastrointestinal bleeding of patients with liver cirrhosis
- Severe neutropenia (<0, 5×109/l) and /or severe immune suppressed condition, before the following treatments with high risk of bacteraemia:
- dilatation of oesophagus
- varice sclerotization
- ERCP in case of obstruction of bile or pancreas duct.

The applied medication during the examination for facilitating the evaluation and performance of the diagnostic and therapeutic examination

- *Medication reducing peristaltic* (hioscin butilbronid/ Buscopan/ or glucagon/Glucagen)
- *Nitro-glycerine spray* (Nitromint, Nitrolingual)
- *Simethicon suspension* (Espumisan, Sab simplex)

The Endoscopic Nurse's Duties Before the Endoscopic Examination

Cleaning, disinfecting and preparation of the equipment are indispensable. General device preparation for gastrointestinal endoscopic examination (oesophago-gastro-duodenoscopy, ERCP, jejunoscopy, balloon enteroscopy, sigmoideoscopy, colonoscopy and bronchoscopy):

- The endoscope is connected to the light source / video processor, to the filled water cisterns and fluid aspiration apparatus; check the endoscope, at flexible devices the control of the air dispensing operation, the interoperability of the working channel by water flushing, as well as the sufficient mobility of the end of the device and the working channel lever.
- Accessories of the endoscope (biopsy forceps, polypectomic loops, hemostasis arsenal, other specialized accessories, depending on the test indication)
- Cutting and coagulation device and its accessories
- Fluid absorption device, respectively ensuring access
- Bed sheet, rubber sheet on the examination table
- Non-sterile plastic gloves
- Protective cape, mask, goggles
- For local anesthetic (Lidocain - Lidocain Spray 1%), analgesic, sedative (midazolam / Dormicum / and / or pethidin / Dolargan /) hioscin butilbromid (Buscopan), vials, devices, simethicon (Espumisan, Sab simplex) suspension required for intravenous injections
- Plastic mouthpiece (the protective equipment will be placed between sets of teeth)
- Paper towels
- Devices necessary for the control of vital signs (blood pressure meter, thermometer, clock, pulse oxymeter)
- To ensure the option of oxygen dosage through oxygen probe
- Resuscitation equipment, defibrillators, the availability of basic medication, benzodiazepines and opiate antagonists (flumazenil / Anexate / and naloxone / naloxone) should be checked to prevent allergic reactions.

The following procedures require special additional preparation: ERCP, rectosigmoideoscopy and colonoscopy, balloon enteroscopy, bronchoscopy, cystoscopy, diagnostic laparoscopy, capsule endoscopy.

Patient Preparation

- Psychological preparation
- History, information, statement of agreement
- Monitoring vital parameters
- Medication preparation
- Medication intake before the examination

The medications that morning, if necessary (e.g. antihypertensives, bronchodilators) should be administered with some liquid. In the case of diabetes mellitus: ambulatory patients should not take their medicine, they should not inject insulin but should bring their breakfast, because after the examination they will take their medication, insulin, and have breakfast. First blood glucose monitoring should be performed for in-patients, then the appropriate amount of insulin and 10% glucose infusion should be given in the morning, before the examination (the amount to be administered is prescribed by the doctor).

Local anaesthesia sedoanalgesia, anaesthesia

The nurse / assistant is responsible for the preparation, if necessary, themaintenance of the vein and cannula, the disposal of waste, and documentation. During the premedication, known drug hypersensitivity or intolerance must be taken into account.

Antibiotic prophylaxis:

The nurse is responsible for the preparation, if necessary, she ensures the vein, she does selective waste management and documentation.

Other

Before oral examination (oesophago-gastro-duodenoscopia, ERCP, enteroscopy, bronchoscopy) the dentures must be removed. The day before capsule endoscopy the battery of the recorder unit has to be charged. Before the examination, the patient data have to be entered into the computer.

The preparation of the gastrointestinal system

Oesophago-gastro-duodenoscopia, jejunoscopy, ERCP:

The preparation is designed to reduce the risk of aspiration of gastric contents. during the examination. The examination should be carried out on an empty stomach. The patients are not allowed to have solid food at least 6 hours or to drink fluids four hour prior to the examination. Children under 5 months can have milk, formula or solid food 4 hours before it; between 6–36 months 6 hours and over 3 years of age 8 hours before the endoscopy. A full stomach is the contraindication of the examination, but if the time factor is justified, the examination can be performed after gastric lavage.

Colonoscopy, balloon enteroscopy

The purpose of the preparation is to have bowel lumen free from bowel content and stool. On the third and second pretest day fibre-, mushy diet promotes colon clean-up. On the day before the test it is recommended to have only plenty of fibre-free fluid intake in the form of soft drinks. Three hours before the examination the patient should not take any more fluids. Bowel cleansing methods: 2x45 ml sodium phosphate solution (the night before and 3 hours before the examination), without enema, making the patient drink 4 litres of electrolytic solution (6.5 g / l NaCl, 2.5 g / l $NaHCO_3$ and 0.75 g / l KCl) or inject it through a tube into the intestine (bowel cleansing) for four hours before the examination; isotonic electrolytic solution) containing Macrogol (PEG) (59 g macrogol 4000, KCl 0.76 g 1:47 g NaCl, 1.69 g $NaHCO_3$ powder dissolved in 1 litre of water, possibly supplemented by 5.69 g Na_2SO_4), in 3 parts (at noon and in the evening the day before, and in the morning of the day of the examination) consumed for 1 hour (the day before the examination a total of 5 litres of fluid should be drunk), 2–3 litres of 5% (isotonic) watering of mannitol solution in 1—2 hours, before the test; 2x125 ml 25% $MgSO_4$ solution watered the day before the examination; enema before the test using factory products (Picoprep, endo-star lavage, X-Prep).

Capsule endoscopy

The day before capsule endoscopy the patient can only consume clear liquids, and from 10 pm, nothing. The evaluation of the image can be improved in the case of capsule enteroscopy by intestinal cleansing performed by polyethylene glycol or sodium phosphate solution the night before, in the case of capsule colonoscopy intestinal cleansing preparation in accordance with colonoscopy should be applied. The patient should be informed that while the capsule is in the intestinal tract, strong electromagnetic fields must be avoided (MRI room, amateur radios), because the data in the capsule may be lost due to radio interference. During the test, every 15 minutes it must be verified if the device lights indicating the operation are blinking and heavy physical work, sweating should be avoided. If the patient complains about abdominal pain, nausea, or vomits during the examination, the doctor should be notified.

Bronchoscopy

The preparation is designed to reduce the risk of aspiration of gastric contents during the examination. From midnight the patient is not allowed to drink or eat, a minimum 8-hour fasting is required. 24-hour smoke-free status is desirable.

Laparoscopy

General surgical preparation (empty stomach and bowels, empty bladder): the patient is not allowed to receive anything orally for 8 hours before the examination, the patient receives enema in the evening and in the morning, we must ensure that the patient should empty his bladder before the examination; the hair from the patient's stomach should be shaved.

The endoscopic nurse's duites during the endoscopic examination

The positioning of the patient on the examination table, if there is no contraindication, is done in the following way:

- Oesophago-gastro-duodenoscopia, ERCP, enteroscopy: recumbent position on the left side, with the head bent forward toward the chest.
- Colonoscopy, flexible rectosigmoideoscopy: lying on the left side, knees bent (Sims position).
- Rectosigmoideoscopia with hard endoscope: knee-elbow position
- Bronchoscopy: sitting or lying position with head bent backward
- Cystoscopy: stone-cutting situation, the patient's buttocks being slipped forward to the edge of the table, with his legs on the footrests. The legs can be fixed with straps.
- Laparoscopy: supine position, in the case of diagnostic examination performed without general anaesthesia, the arms should be fixed with straps. Before tracheal-aspiration or intratracheal intubation the patient's head should be turned on the side, taking care to prevent the tongue falling back, lifting the mandible forward, make the patient lie in the Trendelenburg position.

The endoscopic nurse is responsible for the observation of the below mentioned: monitoring the vital signs (when sedation is used, in the case of awake, conscious patients observe the breathing rate,

breathing depth and the breath sound, the penetrability of the airway, pulse, appearance of labial cyanosis, flushing, and the state of mind prior to, during and after the endoscopy), observation of signs of aspiration, and the use and monitoring of pulse oxymeter. The nurses are responsible for the additional tasks: administration/injection of premedication, infusion, ECG monitoring, assisting the physician during the test (e.g. putting the endoscope, probes and other equipment accessories into the doctor's hands), cooperation in the execution/performance of tracheal aspiration or intratracheal intubation assisting the prevention of cardiorespiratory, bleeding or other complications, resuscitation, if necessary, dosage of O_2 at a speed of 2–4 ml / min.

The endoscopic nurse's after the endoscopic examination

ERCP, the endoscopic examination and the treatment of the patient bleeding from gastro- intestine as well as laparoscopy are *examination procedures requiring hospitalization* so the observation is the task of the appropriate staff department. Other examinations may also be performed as an outpatient, in which case the patient is in a room dedicated for endoscopic surveillance and is observed by endoscopic specialized personnel. The required observation time depends on the type and the applied premedication of the examination.

After pharynx anaesthesia (Lidocain – Lidocain spray) observation is required until the effect of the applied product ceases but at least for 30 minutes, during this time the patient cannot eat or drink. If sedation was performed, the patient can leave only with a guide after the ambulatory examination. For 24 hours, they cannot drive, handle heavy machinery, or sign a formal contract document. The patient can be released if his vital signs are stable, he has regained the level of vigilance.

After esophageal varices sclerotizing or rubber ring ligation on the day of the examination only fluid can be taken, the next day just mushy food can be eaten. After general anaesthesia 4 hours of observation in hospital departments is required.

After polypectomy, mucosectomy 24 hours of observation is suggested for early detection of potential bowel perforation.

During endoscopic examinations various *complications* may occur, the observation of which is the endoscopic nurse's task, or rather the nurse's task in the hospital ward after the patient has been taken to his ward. The patient's age, general condition, compliance, type of premedication, the type of intervention can be influencing factors concerning the development of potential complications.

The following complications should be expected:

- Drug-induced allergy due to the medication used in pre-medication
- Contrast medium allergy
- Cardiorespiratory failure in patients at increased risk as a result of the examination or sedoanalgesia
- Complications of instrumental examinations and interventions (see section Types of endoscopic examinations): bleeding and perforation –with a different frequency per examination – can be considered the most common.

General aspects:

- Observe and record vital signs (pulse oxymetry if the patient's oxygen saturation drops below 90% during the examination)
- Allergic reactions are observed
- Tissue sampling, the observation of signs of bleeding (the cardinal symptoms, secretions) after the removal of polyp, mucosal resection, post-sphincterotomy or resulting from the damage of the wall of the urinary system /gastrointestinal / respiratory system /.
- Pain (e.g. abdominal pain) is measured with the help of one-dimensional or multi-dimensional scales, monitor signs of severe pain which may indicate perforation.
- Special Measures
- For 2 hours after colonoscopy, enteroscopy, bronchoscopy the patient cannot eat or drink.
- After ERCP monitor the symptoms of pancreatitis, check the temperature 4 times daily, check serum amylase and blood count the next morning.
- After capsule endoscopy monitor the signs indicating intestinal obstruction (the capsule may get stuck in the intestines).
- After cystoscopy: administration of analgesic, if necessary, an anaesthetic solution can also be given into the urethra, physician must be notified if fever occurs, oral rehydration should be encouraged, the nurse should write a fluid chart, if necessary; administration of the infusion, urinary process monitoring (more than 8 hours after the intervention the inability to urinate may occur); assess the quality of urine (having dysuria, a burning feeling, small amounts of blood in the urine during urination can be considered normal in the first two days) 24 hours after the procedure check frequency, quantity and colour of urine.
- After laparoscopy: the patient is received in the hospital ward; positioning (stretched position, lying on your back), monitoring vital signs (every 15 minutes until complete consciousness is regained); fluid replacement is encouraged management of the fluid chart, patient observation (skin, facial expressions, conscious state).

The management of the test samples taken during treatment:

- Closing the sampling vessel
- Fill in the examination request form
- Sample and test request forms are sent to the laboratory
- Documentation of the sampling procedure
- Handling, cleaning, disinfection, sterilization of the endoscope and its accessories.

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31. Puncture and biopsy

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Puncture (punction), aspiration (for sample collection) and centesis (fluid withdrawal)

Puncturing is an invasive intervention which involves the act of puncturing a body cavity or organ through the skin (percutaneous layer) with a needle.

Its purposes include:

- **Injection:** the administration of medication by puncturing the skin, the subcutaneous tissue, the muscles or central or peripheral veins.
- **Aspiration**: fine-needle sample collection for cytological analysis.
- **Centesis**: the puncture of visceral cavities (e.g. kidney pyelon) or body cavities to draw out secretions or fluids with a therapeutic purpose.

The fluid accumulated between the parietal and visceral lamina surrounding body cavities and organs are normally sterile. During medical interventions asepsis rules must be observed strictly. The secretions collected must be sent to laboratory in sterile sample containers.

Biopsy

The word 'biopsy' has a Greek origin. It means sample collection, excision from an organ or tissue. It is an invasive process either for diagnostic purposes or to assess the efficacy of an applied therapy. Biopsy results give information about the staging and grading of the disease and the efficacy of the treatment.

Biopsy types:

- core or incisional biopsy – a piece of sample tissue is removed
- thick-needle biopsy (core biopsy)
- fine-needle biopsy (fine needle aspiration cytology) – sample is collected with a needle (G22-23) and syringe (10-20 ml)
- image-guided biopsies (US, CT, MRI, X-ray)

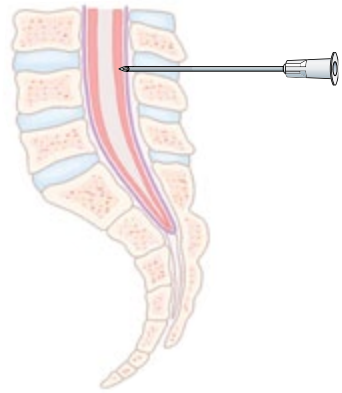
Nursing tasks prior to performing puncture and biopsy

- Verification of the identity of the patient
- Assessment, anamnesis
- Psychological preparation, patient education
- Ascertainment of the patient consent form
- Laboratory examinations

Before puncture it must be made sure that the patient's laboratory results are not older than 30 days; the measurement of coagulation parameters (e.g. prothrombin, INR) is especially important in order to prevent bleeding complications.

Lumbar puncture

Lumbar puncture is a diagnostic or at times therapeutic procedure performed in order to collect a sample of cerebrospinal fluid (CSF; liquor cerebrospinalis), which involves the insertion of a special spinal needle equipped with a mandrin in the subarachnoid space in the area of the lumbar spine in order to draw out CSF (Picture 1.). (MCann 2008, Roos 2003, Straus et al 2006, Sucholeiki-Waldman 2006).



Picture 1.:
The site of lumbar puncture

Cerebrospinal fluid (CSF)

CSF is a clear fluid circulating in the ventricles of the brain and in the subarachnoid space, the volume of which is 120-150 ml.

Indications for lumbar puncture

Diagnostic purposes

- inflammatory diseases of the nervous system,
- subarachnoid haemorrhage,
- suspected extension of parenchymal bleeding into the ventricles (not shown by imaging)
- normal pressure hydrocephalus (NPH),
- diagnosis of degenerative diseases of the central nervous system
- examination of CSF circulation disorders (radionuclide cisterno-myelography)
- administration of contrast agent for myelography (today uncommon because of modern imaging technology)

Therapeutic purposes

- Intrathecal medication (antibiotics, cytostatics);
- Rare cases of increased CSF pressure (pseudotumor cerebri – idiopathic intracranial hypertension)

Contra-indications to lumbar puncture

Lumbar puncture is contra-indicated in case of suspected or actual space-occupying processes involving increased intracranial pressure due to the risk of foraminal herniation of the cerebellar tonsils. It is also contra-indicated in case of inflammatory skin infection at the puncture site.

Relative contraindications include thrombocytopenia, coagulopathy, and prolonged anti-coagulant therapy (Barker 2002, Szirmai 2001).

The performance of lumbar puncture

Positioning for lumbar puncture

- sitting position
- lateral recumbent position

Lumbar puncture needle insertion

Before inserting the lumbar puncture needle local anaesthesia of the site may be carried out by subcutaneous lidocaine or marcaine injection. It is not obligatory to use anaesthetics; it depends on the physician's decision with respect to the circumstances. After measuring the opening pressure 5-10 ml of cerebrospinal fluid is drawn out slowly, which is collected into 3-4 numbered test tubes.

Measuring CSF pressure

A sterile, L-shaped, solid or flexible, 30 cm long tube (manometer) with a diameter of a few mm is used for measuring the pressure, which may be scaled in cm. Pressure must be taken in a lateral recumbent position, and the patient is asked to stretch his lower limbs slowly and carefully.

Management of the collected CSF sample

During a puncture usually 2-2 ml of CSF is collected into 3 or 4 test tubes. Traditionally the cell count, the CSF total protein and sometimes the cytological tests have been performed immediately by the physician by the sick-bed. However, in today's hospital systems cytological and chemical tests of the CSF are carried out by integrated laboratories to which the samples are to be sent immediately together with the indication of the direction of the tests to be performed. In case of suspected acute inflammatory diseases the fluid must be forwarded immediately for microbiological testing to the nearest microbiological laboratory.

Pathognomonic CSF

Normal CSF is clear, transparent and colourless. Normal cell count is 5-10/3 (according to traditional data; in 3 mm^3 Fuchs-Rosenthal counting chamber). Any change in the colour of the fluid is regarded as pathological.

The complications of lumbar puncture

The most common complication following lumbar puncture is post-spinal headache. This frontal and occipital ache radiating to the neck and shoulders occurs in 20–70% of patients, and it is often accompanied with nausea, dizziness and photophobia (Frank 2008, Ahmed et al 2006). The risk of post-spinal headache can be reduced by using a thinner needle. If the patient stays in prone position for two hours after the procedure, this condition may be prevented. Complaints gradually diminish with fluid intake, caffeine intake and bed rest.

Epidural, subdural or subarachnoid bleeding after lumbar puncture occurs very rarely.

As a consequence of breaching asepsis rules post-infectional complication may evolve (skin abscess, epidural abscess, spinal abscess). The most severe potential complication is foraminal herniation after lumbar puncture (also termed as post-dural puncture cerebral herniation in certain sources).

Nursing Care following a lumbar puncture

The nurse provides bed rest for the patient after the procedure. The patient is positioned in prone position for 1-3 hours in order to reduce CSF leaking and to prevent post-spinal headache. 24-hour bed rest is recommended afterwards. During this period basic needs must be satisfied (hygiene, secretion, nutrition, sleep).

Vital parameters are monitored in every fifteen minutes in the two hours following the procedure, then in every 4 hours or in case of any complaint.

Cisternal puncture

CSF is drawn out of the intracranial space; from the area of the ***cisterna magna*** (cerebellomedullary cistern) transcutaneously; between the cerebellum (little brain) and the medulla oblongata (spinal bulb). The needle is inserted into the skull below the occipital bone. The procedure involves a risk of injuring the brain-stem. (Zukas 1999)

Indications:

- If CSF cannot be obtained by lumbar puncture due to spinal deformity or extended skin infection
- In order to examine the disorders of CSF circulation by cisternal administration of a contrast agent.

Preparation of the patient

Physical preparation is identical to the procedure detailed in case of lumbar puncture, but in addition the occipital area needs to be shaved, the skin must be disinfected and the skin area surrounding the site of the puncture must be isolated. As to psychological preparation, patient compliance must be emphasised, so that the patient would not move the head in the moment of the insertion of the needle.

Peritoneal (ascites)-puncture (abdominal puncture / abdominal paracentesis /„abdominal tap")

During abdominal tap the fluid accumulated in the peritoneal cavity is drained for **diagnostic or therapeutic** purposes. Regarding the technique, it can be performed by ultrasound guidance or blindly, relying on the results of physical examination. (Altman 2010, Shlamovitz-Shah 2010, Thompsen et al 2006, Twaites 2009)

Indications and contraindications for peritoneal puncture

Indications: to eliminate new onset ascites or ascites of unknown origin; ascites of known etiology with decompensation together with the following symptoms: fever, peritoneal irritation, encephalopathy, gastrointestinal bleeding, sepsis or hypotension; malignant ascites; pancreatic ascites; and distentional ascites with a therapeutic purpose.

Absolute contraindications: acute abdominal trauma and coagulation disorders (DIC, fibrinolysis). *Relative contraindications:* lack of patient compliance; surgical scar at the proposed site of puncture; thrombocytopenia, coagulopathy; severe bowel distention; severe obesity; pregnancy.

Potential complications of peritoneal puncture

Complications may include *infection; abdominal wall haematoma; ascitic fluid leakage* at the site of puncture; spontaneous *hemoperitoneum; bowel perforation; bleeding; post-paracentesis hypotension.*

The drainage of a too high a volume of fluid at one time is not feasible without the risk of circulatory failure.

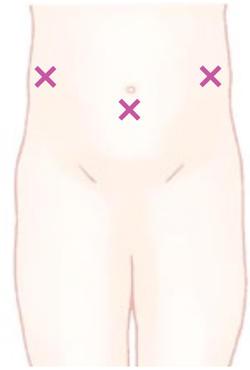
Examinations before abdominal tap

From all physical methods of examination *percussion* provides the most pieces information in the diagnostics of ascites. Owing to the development of imaging methods, as little as 100 ml of fluid can be detected with *ultrasound.*

Prior to paracentesis, the site of puncture can be localised and the direction of penetration determined by ultrasound examination. The depth of penetration depends on the amount of abdominal fat; in case of obese patients up to 12–13 cm-long needle may be required.

The procedure of abdominal puncture

Laboratory test results must be checked before the procedure. After surveying contraindications, position the patient in Fowler's position. After positioning *mark the site of puncture.*



Picture 2.: Possible sites for abdominal tap

Nursing care after abdominal tap

Keep the patient on *bed rest for at least six hours.* The patient is allowed to get out of bed the following day, and the dressing can be removed from the abdomen as well. If hypotension has occurred the patient must be laid in Trendelenburg's position.

Apply *pressure dressing over the puncture* site. The puncture site must be kept under continuous control due to potential persisting fluid leakage. After wound care place the folded drawsheet on the abdomen as a corset belt, and fasten it with a safety pin. The puncture site should become painless after the intervention.

Vital parameters must be checked in every 15 minutes in the first hour after the procedure, then in every 4 hours until the patient's condition is stabilised. Pay attention to any signs of persisting leakage or intravascular conditions (hypotension, tachycardia).

Thoracocentesis (thoracentesis, pleural tap)

Pleural tap is an invasive intervention *to remove* pathologically accumulated *fluid or air from the pleural space.* The procedure can be performed both for diagnostic or therapeutic purposes.

Indications and contraindications for pleural tap

The *diagnostic purpose* of thoracocentesis is to determine whether there is any fluid or air between the pleural layers. From a *therapeutic* perspective, the aim is to alleviate respiratory distress or failure originating from a large amount of fluid or air, which causes complaints for the patient. Therapeutic indications also include the administration of medication between pleural layers. Depending on the patient's body weight, at most *1500 ml of fluid is drained at one time,* which reduces the risk of pulmonary oedema.

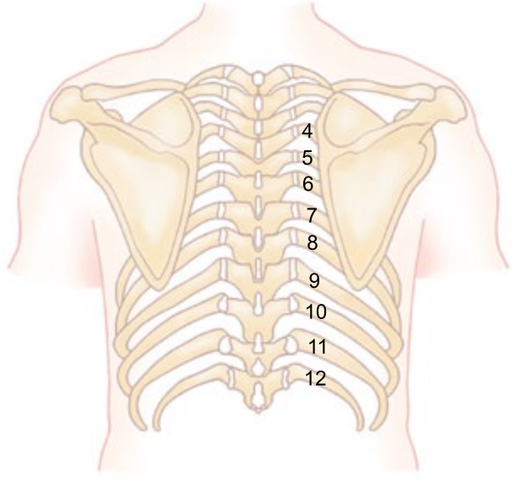
Potential complications of pleural tap

The risk of complications resulting from pleural tap is minor. Fatal complications are extremely rare. Occasionally *slight pain* may occur when the lungs are filled with air, and they reach the chest wall when dilated. The exclusion of the risk of *pneumothorax* after pleural tap can be justified by thoracic X-ray. Patients may experience *dizziness* and *difficulty of breathing* for a short period. Other possible complications may be *bleeding* between the layers of the pleura; *enervation, infection, spleen or liver injury,* and extremely rarely *embolism* or *subcutaneous emphysema.*

Examinations before pleural tap

Pleural fluid must be localised before the intervention by means of *physical* examination (listening, percussion), *thoracic X-ray, ultrasound* and/or *CT* (computer tomography).

The proposed site for the puncture – depending on the effusion – is either on the left or on the right side of the chest, 5-10 cm under the fluid level, next to the spinal column, *above the ninth rib* (picture 11.), at the *upper edge of the lower rib* to avoid neurovascular region.



Picture 3.: Insertion site (thoracocentesis)

Nursing care after thoracocentesis

Provide bed rest for the patient in *supine* position, or suggest lying on the side on which the puncture has been carried out. Vital parameters need to be checked in every 15 minutes in the first hour after the procedure, then in every 4 hours. The risk of post-puncture pulmonary oedema can be reduced if the amount of fluid drained during one intervention does not exceed 1500 ml. (Trachiotis et al 1997)

Chest tube

If air or fluid (exudate, transudate, blood or lymph) enters the pleural space, the lungs are unable to follow up with the deflection of the chest, thus to ventilate. If air enters the pleural space, the phenomenon is called pneumothorax (PTX).

The treatment of pneumothorax

In lack of other means, emergency treatment of PTX includes *detensioning with cannula*. In case of artificially respirated patients, in lack of equipment or staff for chest tubing, *emergency thoracotomy* may be needed to be performed.

Delayed (non-emergency) PTX care means *chest tubing.*

Pericardial puncture

Pericardial puncture serves for the removal of effusion accumulated in the space between parietal and visceral pericardial layers (pericardiocentesis).

Pericardial effusion may be caused by:

- Pericarditis
- Trauma
- Aortic dissection
- Cardiac or thoracic surgical intervention
- Renal failure
- Tumorous changes (malignant effusion)

Effusion between the pericardial layers (inflammatory fluid, exudate, transudate, blood) may form a significant mechanical blockage, consequentially compromising mechanical operation even when the electrical activity of the myocardium is intact (pericardial tamponade).

Indications based on the above:

Emergency pericardiocentesis:

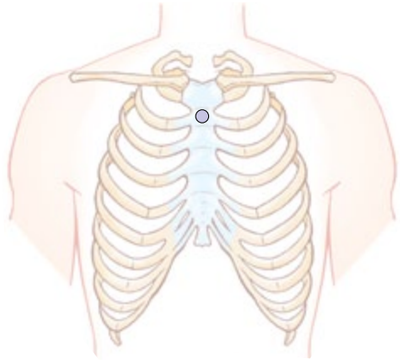
- life-threatening pericardial effusion due to haemodynamic instability, or its suspicion in case of electromechanical dissociation.
-

Elective pericardiocentesis:

- in case of haemodynamically stable patients an experienced and trained person may perform drainage with diagnostic, palliative or prophylactic purposes, with the guidance of imaging techniques (US or CT).

Contraindications:

- There is no absolute contraindication for emergency pericardiocentesis: even pericardiocentesis performed by insufficiently experienced persons may lead to success, while its absence may result in the biological death of the patient due to the permanent lack of successful resuscitation.
- Relative contraindications:
  - Aortic dissection
  - Coagulation disorders
  - Traumatic tamponade



Picture 4.: Sternal puncture

Bone marrow aspiration, biopsy

Bone marrow examination

Haemopoietic bone marrow is found in the spongious tissue under the solid, compact tissue of the bones of the proximal part of the bones of the limbs, and in the axial skeleton of adults.

Bone marrow aspiration and biopsy give information about the status of blood production system and the quality of the produced blood cells (number, size, shape of cell types; rate of mature and immature blood cells).

Indications for bone marrow examination

- *Oncological/haematological diseases:* e.g. Hodgkin's lymphoma, non-Hodgkin lymphoma.
- *Haematological diseases:* B12/folic acid deficiency, iron-deficiency anaemia (Godberg-Sacher 2008).
- *Non-haematological diseases:* fever of unknown origin (AIDS), suspected iron poisoning, contagious diseases (tuberculosis, histoplasmosis, fungal infections, mononucleosis), storage disorders.

Contraindications and complications

Contraindications for the treatment include the *infection* or previous *radiation* of the proposed site of aspiration/biopsy, *anti-coagulant medication, non-compliant patient. Haemorrhagic diathesis* and serious *thrombocytopenia* mean relative contraindication, since these conditions can be improved by the administration of blood derivative products.

Rare complications include *osteomyelitis, tumour implantation* on the needle route, and bone marrow *embolus.* In case of sternal puncture the injury of the right ventricle and of the ascending aorta can be fatal (Chesnutt et al 1995).

Sample collection sites

The recommended site of sample collection is the *crista iliaca (iliac crest),* notably the posterior superior iliac spine; the protuberance palpable at the posterior medial border of the ala. In practice, sample also may be collected from the anterior superior iliac spine.

Another possibility is *sternum aspiration* (picture 24.), the advantage of which is that the marrow is richer in cells, and haemostasis is easier in case of patients suffering from thrombocytopenia or haemophilia. Sample collection from the sternum may involve the risk of serious complications (aorta injury), therefore it is not advised to perform it on children under 12 or on agitated patients.

A third optional site, the *shinbone (tibia)* is indicated in case of infants younger than 1 year, in which case sample collection is carried out in narcosis.

Preparation of bone marrow aspiration/biopsy

Before the procedure blood must be taken to define *thrombocyte number and coagulation parameters.* If the patient is on AP (aspirin, clopidogrel) or VKA (coumarin, warfarin), these are replaced with LMWH prior to the procedure.

Inform the patient that when the needle is inserted, strong pressure may be felt in the sternum, and an uncomfortable, creaking sound may be heard. During the aspiration of the bone marrow an unpleasant suctioning feeling and pain in the sternum is experienced, but this will cease in a few seconds.

In order to alleviate pain and inconvenience and assure patient compliance, local anaesthetics are applied at the site of the puncture. The most frequently applied anaesthetic is Lidocaine (Hyan et al 1994).

Position the patient should be placed in the appropriate position before the intervention:

- For crista biopsy, position the patient in lateral recumbent position, or e.g. in case of surgical operation, in prone position.
- For sternal biopsy/aspiration lay the patient in supine position. The pillow must be taken from under the head.

Nursing care after bone marrow aspiration/biopsy

Minimise bleeding by applying pressure after the procedure forapproximately. 5 minutes, then local antibiotics and dressing need to be applied over the site of the puncture. In case of haemophiliac patients pressure dressing also must be applied. If bleeding does not cease, pressure dressing must be applied for at least 30 minutes. If bleeding increases the patient will have to stay in supine position for another hour. The puncture site must not get into contact with water for 48 hours; keep it dry.

Monitor vital parameters (pulse, respiration, blood pressure, body temperature) until they reach the normal range, check for signs of bleeding for 1 hour.

Contact of the puncture site with water should be avoided for 48 hours, the area must be kept dry. Monitor signs of infection: colour, dolour, tumour, rubor. If any sign of bleeding is recognised over 24 hours after the procedure, report to your superior.

If the patient complains about pain, mild analgesics can be administered as necessary. If the patient has received sedatives, sleepiness may occur which can hamper everyday activities and increases reaction time. Take care of safety needs.

Liver biopsy

Liver biopsy is performed in order to diagnose liver diseases, tumours, and certain disorders of the blood production system. Liver tissue can be obtained by thick-needle (core) biopsy, thin-needle (aspiration) biopsy, or in case of their contraindication, by surgical procedures (laparotomy or laparoscopy).

Indications for liver biopsy

The aim of liver biopsy is to diagnose liver diseases, to determine grading and staging, e.g. non-alcoholic autoimmune steatohepatitis, alcoholic liver diseases, haemochromatosis, Wilson's disease, hepatitis B and C viral infection, liver tumour. Indications also include the definition of the grading of the given condition (e.g. hepatomegaly, primary biliary cirrhosis, Primary sclerosing cholangitis, hepatitis); pathological blood and liver function tests; fever, jaundice and infections of unknown origin.

Contraindications of liver biopsy

Contraindications of liver biopsy include patient's noncompliance, coagulation problems, and ascites of over 2 cm width around the liver.

Liver biopsy types:

- Percutaneous biopsy
- Transjugular biopsy
- Laparoscopic biopsy
- (Ultrasound or CT-guided fine-needle biopsy does not make up a separate type; percutaneous biopsies are guided by these techniques)

Medication preparation

For agitated, anxious patients sedatives (diazepam) can be administered. Even narcosis is an option in case of children.

The patient should be nil by mouth from the night before the investigation. Food and drink must not be consumed for at least 4-8 hours before biopsy. Previously taken blood samples must be tested again in order to check the coagulation system (thrombocyte number, prothrombin time). Information needs to be obtained from the patient about the frequency and time of taking coumarin derivatives.

Before the investigation ask the patient to empty his/her bladder. The patient should be taught the proper breathing technique (take a deep breath, exhale all the air, then hold breath for 15 minutes) to be applied during the procedure.

Nursing care after liver biopsy

After the procedure the patient needs 24-hour bed rest (in case of ultrasound or CT-guided sample collection only 4-6 hours of bed rest is enough at normal coagulation parameters). The patient is laid on his/her right side in the first two hours. Vital parameters such as blood pressure, pulse, respiratory rate need to be checked in every 15 minutes during the first hour, then in every 30 minutes in the second and third hour, and later in every hour. The puncture site requires close observation due to bleeding. Signs of bleeding in the abdominal cavity can be observed by measuring the abdominal circumference. Assess the degree of pain with one- or multidimensional scales.

Analgesic medication may be indicated, since mild pain in the upper right part of the abdomen frequently occur after liver biopsy, which may radiate to the right shoulder and is usually diminished by analgesics.

After the procedure thoracic X-ray can be taken to exclude the possibility of pneumothorax, as well as laboratory tests and haematography, thrombocyte number, prothrombin time tests.

Renal biopsy

Renal or kidney biopsy (microscopic examination of kidney tissue samples) is necessary mainly for diagnosing the pathography of the vessels of the kidney (glomerulus) and unknown origins of acute kidney failure. Samples are often collected from transplanted kidneys in order to seek signs of rejection. The aim is to set a defining diagnosis for determining the therapy to be applied (Coresh et al 2007, Whittier-Korbet 2004, Nagy et al 2003).

Indications:

- Prolonged presence of blood and/or high levels of protein in the urine
- Kidney disease of unknown origin
- Determining the grade of diabetic nephropathy
- Following transplantation, in order to prevent rejection of the kidney
- Autoimmune diseases
- Monitoring and assessing conditions in already diagnosed kidney disorder or other diseases affecting the kidneys
- Clarifying the aetiology of focal type kidney disorders

Contraindications:

- untreated high blood pressure
- bleeding disorders
- active urinary tract infections
- the patient has only one kidney (except when it is a transplanted kidney)
- non-compliant patient
- severe hypertension
- acute pyelonephritis
- chronic end-stage renal disease

Complications of renal biopsy:

- The most frequent complication is bleeding which occurs within 24 hours
- Abdominal pain or pain in the waist
- Kidney spasms
- Infections
- Arteriovenous fistula

Exams to be taken before the procedure

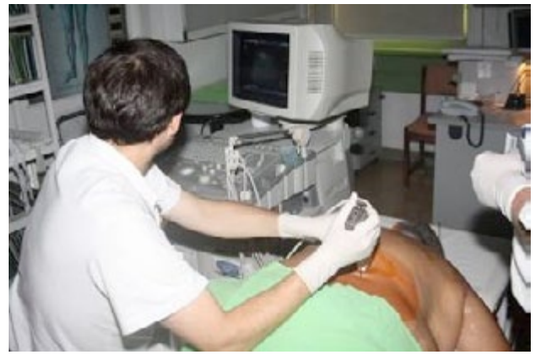
Before renal biopsy, it is necessary to assess renal size and function, together with clotting examinations. The procedure is carried out in local, or at times in general anaesthesia, under surgical conditions.

The procedure is ultrasound-guided for accurate sample collection and in order to map anatomical position. The tissue is removed from the kidneys with a biopsy needle.

General blood and urine tests are compulsory before the proposed examination. Among others, coagulation monitoring factors are observed during the blood test. The patient must not eat and drink for 8 hours before the examination. If the patient is on anticoagulant therapy, medication must be interrupted on the day before the examination.

The procedure of renal biopsy

The procedure is carried out in a minor-surgery operating room. The patient is placed in prone position, local anaesthetics is administered on the skin and muscles over the kidney. The position of the kidney part containing the glomerulus is located by ultrasound or CT, thus larger vessels also can be avoided. The biopsy needle is inserted into the kidney through the skin (picture 28.).



Picture 5.: Renal biopsy

Nursing care after the procedure

4-24 hours' bed rest is necessary after the procedure. The patient is kept in supine position, and *pressure dressing* is applied on the puncture site for four hours.

Monitor vital parameters (especially blood pressure and pulse) and signs of bleeding. Inform the patient about the fact that physical exercise and exertion should be avoided for 1 or 2 weeks even if no complications occur. The patient is required to stay in bed for 24 hours after the procedure, and institutional monitoring is needed for 1 or 2 days, during which haemoglobin level is measured and kidney ultrasound performed. Analgesics may be given on demand. Blood and urine samples are to be taken.

Breast biopsy

Breast biopsy types:

- **Vacuum core biopsy** (VCB; mammotome) is considered the most informative type of breast biopsy today.
- The most invasive technique is **surgical biopsy**, when a cutting is made from the surgically removed tissue. Its special form is freezing, when histological properties are defined during the operation. Its advantage is that the team obtains information about the condition of the axillary ganglia as well.
- **Mammography-guided (stereotactic) aspiration** is used in case of non-palpable changes, which already have been diagnosed by ultrasound examination.
- **MR-guided aspiration** is necessary when the changes only can be shown by MRI.

The procedure and nursing care

Inform the patient, and ask the patient to sign the consent form. The patient needs to undress to the waist. Large accessories (such as long necklaces, big earrings) need to be removed. In case of core biopsy or fine-needle aspiration cy-

tology no dietetic restrictions are necessary, however, the patient is supposed to have only a light breakfast on the day of the procedure. Anaesthetics is routinely administered before core biopsy.

The patient lies in supine or lateral recumbent position, depending of the site of the change. The attending person applies ultrasound gel on the affected site and feels out the lump with the hands. Its position can be clearly seen on the screen. If the lump is palpable, it is fixed between the thumb and index finger of one hand, which is followed by the insertion. Suction is generated after insertion. Sample is obtained by continuous suction and a back-and-forth movement of the needle. The sample is prepared for a smear test.

Nursing care after breast biopsy

After the removal of the needle first apply a pressure dressing, then sterile dressing is applied on the site of the puncture. Pain may be alleviated by wearing a supporting bra in a suitable size. The nurse must check for signs of bleeding. Damage in the integrity of the skin is minimal after needle biopsy, however, it is not advised o remove the dressing and to have a bath or shower within 24 hours in order to prevent infections. If the patient demands so, pain can be alleviated by non-steroid analgesics. Aggravation of pain is a sign of infection. Haematoma over the site of the biopsy is a common complication, which usually reduces within 5–7 days. Physical exercise and exertion should be avoided for at least 24-48 hours. (Braunwald et al 2001, Fischbach 2000, Tierney et al 2000, Forrai-Bodoky 2007).

Thyroid gland aspiration and biopsy

Indications for thyroid aspiration/biopsy

The purpose of the aspiration/biopsy of the thyroid gland is to define the type and nature of the nodules (inflammation, benign, malign), and to aspirate cysts from the thyroid. Indication for cytological examination includes the verification of the existence of thyreoiditis; the definition of inflammation types; the selection of suspected tumours from palpable nodules or nodules (cold nodules) diagnosed by imaging techniques (ultrasound).

Thyroid aspiration /biopsy methods

Sample can be collected either by the excision of a larger piece of tissue (biopsy) or by fine-needle aspiration. The most commonly used method is *FNA (fine needle aspiration),* since it is reliable, simple, cost-effective and the least invasive technique.

Complication of thyroid biopsy

Thyroid biopsy is a safe intervention; it *rarely results in complications.* Subcutaneous haematoma, pain, inflammatory signs may occur at the site of the puncture, as well as purulence on the side of the biopsy.

Preparation of thyroid biopsy,

Before the procedure explain the patient the purpose of the procedure and ask for the patient's written consent. Inform the patient that the procedure will take a few minutes. Ask the patient to remove jewellery and metal objects from the neck and from the waist up, as well as the denture. Tell the patient not to swallow, speak, cough, laugh, shift the position of the neck or move during the procedure (it is best if the attending person informs the patient about the steps of the procedure continuously).

Nursing careafter thyroid biopsy

After the intervention pressure is applied on the site of the puncture for 5–10 minutes to minimise bleeding and swelling; then a dressing is applied. In order to prevent infections the dressing is kept on the site for 8 hours, and the biopsy site must be kept clean and dry. Shower or bathing must be avoided until the dressing is removed. The nurse provides bed rest for the patient after the procedure, and monitors the patient for 30-60 minutes. If the patient complains of pain and discomfort, analgesics (paracetamol) may be administered.

Taking blood from veins and arteries (Phlebotomy; venipuncture and arterial puncture)

Laboratorial diagnostics has become a significant field of medicine. It involves the in vitro examination of various body fluids, discharges and tissue samples collected from living organisms. When testing blood, clinical chemical, endocrinological, haematological, coagulation, microbiological and parasitological tests may be performed separately or simultaneously.

The purpose of laboratory tests is common in each case: to reach a diagnosis for patients with various complaints and symptoms; to verify and refine the diagnosis; to identify the severity of the disease; to trace the progression of the disease; to control side effects; and to perform screening on individuals or groups without any complaints, and to identify the reference range.

There are three stages between the demand for testing and the report of the results. The first one is the *pre-analytical phase* which includes the selection of tests, the preparation of the patient, specimen collection, and tasks related to the storage and transfer of the collected samples.

The second one is the *analytical phase* which includes the identification of the specimen, its rejection if necessary, the preparation and analysis of the specimen and the recording of the results. This phase is closed by the conclusion of laboratory findings.

The last and closing stage of the process is the *post-analytical phase,* which means the report, sending and registration of the results. Lab testing is a circular process, since the physician can decide on further or repeated testing after having received the report.

Errors and mistakes may occur in any (pre-analytical, analytical and post-analytical) phase of the laboratory testing process. According to literature unsuccessful tests are mainly related to pre-analytical errors such as incomplete anamnesis, inaccurately filled laboratory test request form, inappropriate phrasing of the required tests, inappropriate preparation of the patient, improper strangulation, improper specimen collection, storage and transfer. The nurse plays a significant role in the prevention of such errors and mistakes (Nagy-Dux 2006, Juhász-Dux 2000, Endrőczi 2003).

Venipuncture

Blood-taking is the most frequently practised intervention both in in-patient and out-patient care, which is essential in reaching diagnoses and treating diseases. According to the traditional nursing classification phlebotomy belongs to the group of punctures. Nurses may perform it according to the physician's order.

Assessment andanamnesis before venipuncture

The correctness of laboratory results are affected by *factors related to analytic measurement* and *biological (non-analytical) factors.* From the point of nursing biological factors are necessary to be known about in details, since their influence must be taken into account significantly when evaluating results, e.g. starvation, nourishment, the time of day, physical activity, body weight, body position, taking pharmaceutical and recreational drugs, climate, body temperature (Guder et al 2009, Narayanan 2000).

Preparation of the patient before venipuncture

The basis of nursing is understanding treatment of patient. The patient's anxiety can be reduced by attentive and understanding attitude.

It is essential that the specimen is collected *on an empty stomach.* The values of certain parameters differ physiologically in case of empty and non-empty stomach. Restricted diet may be required as well before certain examinations.

The *time of sample collection* as prescribed by physician must be observed strictly, and they must be indicated both on the lab request form and on the sample. In case of in-patients this time is ideally between 7 and 9 a.m., but sudden changes in the patient's condition may necessitate emergency testing. Fluctuations depending on different times of the day also must be taken into account, especially if hormone tests are prescribed.

Phlebotomy needles

Traditional phlebotomy needles are stainless steel tubes with pointed tips. In practice needles are available in several sizes. Disposable, sterile, 21-22 G needles are used for routine phlebotomy, while in case of small or fragile veins 22 G or butterfly needles may be used. For details of injection needles see the chapter on Medication, for butterfly needles see the chapter on Infusion therapy.

The closed system phlebotomy needle is double-pointed. One tip of the needle serves for venous puncture. In the middle of the needle there is helical grooving which ensures the nesting of the needle and the hub. The other end of the cannula (the so-called spike) is covered with a rubber cap which has to be inserted into the hub. If the phlebotomy blood tube is pulled on the spike, it will be able to pierce through the rubber cap and the cap of the blood tube so that blood flow is unobstructed. After the removal of the tube the rubber cap returns into its original shape due to its flexibility, and obstructs blood flow.

Adapter, tube-holder, hub:

Transparent plastic adapters are available in various sizes fitting vacuum tubes of different sizes. They enable the safe and continuous changing of vacuum tubes. The safety of phlebotomy is further increased by the fact that disposable adapters are widely used in everyday practice.

Tourniquets

Tourniquets are thin rubber bands placed on the required limb so as to prevent circulation proximally. They are used before peripheral venipuncture in every case. Tourniquets are described in details in the chapter on Infusion therapy.

Phlebotomy tubes

Phlebotomy tubes are sterile tubes with rubber caps and plastic rings of different colours that can seal the tubes hermetically, which are under vacuum. Vacuum pressure ensures that the amount of blood necessary for the selected test will get into the tube. Various blood tubes can be seen in healthcare. Major companies use a unified colour code for identifying the tube sizes, however, different markings also can be encountered, such as Sarstedt or Kabe.

Specimen labelling:

Make sure that the labelling of the tube happens before sample collection. Do not write or stick anything above the label. Label the specimen tube and fill in the request form carefully in case of specimen requiring immediate testing and report. In haste the "URGENT" notice or the name of the sender may be forgotten. A missing telephone number may endanger quick report and feedback. The specimen label must contain legible information on the following: patient's social security number, patient's name or initials, time of specimen collection, sender identification. The application of bar codes nowadays facilitates and enhances handling of a large amount of samples in laboratories. Laboratory machines "recognise" these bar codes, thus analysis can be started immediately.

Storage of specimen tubes:

The recommended storage temperature is between 4 and 25°C. Do not expose the sample to direct sunlight. Exceeding the recommended storage temperature may deteriorate the quality of the tubes (e.g. decrease in vacuum, drying out of liquid additives, changes in colour, etc.).

Laboratory test request forms

The European Committee for Standardisation (Commission European de Normalization, CEN) specified the formal and content requirements of laboratory test request in 2000 (Sanna et al 2000). This unified, professionally sufficient form has not been applied in Hungary, however, several institutions aim at unification of form and content with regard to local conventions. Nurses need to check the request form concerning the following:

- Patient's name, date of birth, sex
- Data of the physician requesting the test
- In-patient or out-patient
- Clinical diagnosis (code)
- Test request: routine or urgent (stat)
- Type and origin of specimen
- Date and time of sample collection (year, month, day, hour, minute)
- Date and time of sample receiving (year, month, day, hour, minute)
- Relevant therapy details (e.g. medication)
- The person entitled to receive the report (site of receiving the report; ID of the authorised physician)

Observance of work safety regulations

Strict work safety rules must be observed when handling specimens. Blood is a potential source of infection, therefore the use of latex gloves is obligatory during phlebotomy. However, the observance of the rules for using modern, disposable, closed-system equipment reduces the risk of infections and needlestick injuries significantly.

Protocol for venipuncture

Equipment to be prepared:

- Equipment to protect the bed: wadding, small size rubber and textile sheets, Chux pads

Table 1. Venipuncture

	Steps	Explanation
1.	Perform hand hygiene.	To observe asepsis-antisepsis rules.
2.	Identify instructions related to phlebotomy.	
3.	Assess potential contra indications and complications before performing phlebotomy.	
4.	Assess patient factors such as diet, lifestyle, physical activity, medication, drugs, body position, time of specimen collection, which may affect the results.	To reduce the risk of pre-analytical errors.
5.	Prepare the room (ward/examination room) for the procedure.	
6.	Identify the patient; inform the patient about the necessity and process of the procedure.	It can reduce anxiety and enhance compliance.
7.	Perform hand hygiene. Put on disposable gloves.	To prevent the transfer of micro-organisms.
8.	Select the required tubes and line them up.	
9.	Place the patient in the necessary position, or ask the patient to sit down or lie down.	If the patient is made to stand up from lying position, intravasal volume will decrease. The increased hydrostatic pressure causes fluid to press in the interstitium. It may increase the concentration of non-ultrafilterable elements (formed elements, proteins, materials bound to proteins) in the blood up to by 10%.
10.	Assemble the phlebotomy equipment. Remove the grey part of the protecting cap of the needle. Screw the cannula in the tube-holder. Make sure that the needle is fastened and it will not loosen during the procedure.	
11.	Place a towel or Chux pad under the limb.	To protect the bed.
12.	Select the puncture site. You can enhance the protrusion of the vein: Uncover the patient's arm. Stroke down the vein in distal direction. Ask the patient to clench the hand a few times. Pat the proposed vein slightly.	Venous blood is most frequently drawn from the cubital vein (from the bend of the elbow). The cubital vein can be brought into stasis easily by the strangulation of the upper arm. It is relatively easy to find even in case of obese people.
13.	Place the tourniquet about 7,5 cm above the proposed puncture site without causing pain. It must be tight enough to prevent venous circulation, but not as tight as to prevent arterial circulation. Strangulation may last for maximum 1 minute.	Results may be compromised due to haemocontrentation.
14.	Disinfect the proposed puncture site carefully.	Always check the disinfection time of the chemical used as disinfectant. In most cases the contact time is between 15–30 minutes. Always observe this period. Do not touch the surface again after disinfection (i.e. do not try to feel the vein again).
15.	Hold the patient's arm downwards at an angle.	
16.	Remove the needle protecting cap.	
17.	The procedure of the puncture: Stretch the skin below the tourniquet with your non-dominant hand. Perform the venous puncture with your dominant hand while the patient's arm is kept downwards. The angle of insertion is 15–30°. Push the needle 10–15 mm forth; until it reaches the venous lumen.	
18.	Push the tube into the holder until the needle pierces through the rubber cap completely.	Make sure that the tube is inserted through the middle of the rubber cap. This way blood leakage reduction in vacuum before due time can be avoided.
19.	Release the tourniquet as soon as blood emerges in the phlebotomy tube.	
20.	When the tube is filled completely and blood flow has ceased, slowly pull the tube out of the holder.	
21.	Place the other tubes in the holder one by one. Pay attention to the recommended order of phlebotomy tubes.	
22.	Sway the tubes cautiously 5–10 times (coagulation tubes: 4 times, EDTA and homocysteine tubes: 8-10 times) right after taking the blood so that blood can mix with additives completely. It can be seen clearly that air bubbles move from one side of the tube to the other at each swing.	Never shake the tubes! This may lead to the formation of foam, haemolysis, which corrupts the results. Insufficient mixing leads to false results.
23.	When the last tube has been filled, remove the needle with the hub from the vein. Keep press dry, sterile gauze sheet on the puncture site until bleeding ceases. Sterile plaster can be applied as well if necessary.	Some blood may be left in the sealing cap of the tube after phlebotomy. When working with the tube take extra care to avoid direct contact with this blood. All blood-contaminated tube holders must be handled as hazardous waste, and be disposed of as soon as possible.
24.	Place the patient on rest.	
25.	Clean up the patient's environment.	
26.	Szelektíven kezelje a keletkezett hulladékot	Do not re-sheath the needle to avoid needlestick injuries.

27.	Perform hand hygiene.	To prevent the transfer of micro-organisms.
28.	Document the procedure: date and time of phlebotomy, factors influencing phlebotomy (diet, physical activity, medication, drugs, body position), what tests are requested to be performed on the sample, how the patient tolerated the procedure, condition of the skin (e.g. bruised, haematoma), lab test result values.	

- Disposable latex gloves
- On the phlebotomy tray:
  - Tools for disinfection: skin disinfectant (spray, disinfectant wipes)
  - Phlebotomy tools: labelled phlebotomy tube of the required size and lumen; needles for closed-system phlebotomy; hub; disposable gloves; strangulator (with automatic lock if possible)
  - Cotton swab, sticking plaster, scissors
  - Container for the safe disposal of used needles
- Protective glasses
- Phlebotomy chair
- Laboratory test request form
- Tools for documentation: pen, medical chart

Nursing care after venipuncture

Advise the patient to rest *after phlebotomy*. Tidy up the ward/ examination room according to the rules of handling and storing hazardous waste. Put the needles in the specified container. Do not place them back in their holders! Make sure that the specimen is transferred to the laboratory immediately after the procedure. The sample must not be shaken during transport since it may haemolyse. Samples must be stored protected from sunlight, otherwise bilirubin concentration will decrease. Certain tests need to be performed immediately from the freshly taken specimen.

Most frequent errors occurring during transport include delays in transport; lack of suitable container or shelving, breaking, shaking, extremely high or low temperature, contamination, leakage, lack of documentation (receiving and transmission of the specimen).

Monitor the patient's condition after phlebotomy. Brief sickness, paleness, weakness, possibly fainting may occur. Fainting may be caused by sudden loss of blood, heart rhythm disorder, hypoglycaemia or hyperventilation, as well as exhaustion. Psychological factors are often in the background of fainting, such as the sight of the blood or the needle. If the sitting patient feels weak, ask him/her (or help, if necessary) to bend the head between the knees. Place cold poultice on the back of the neck. If the patient is conscious, or has come to, a glass of cold water may help, too.

The most common ***complication*** resulting from phlebotomy is haematoma. It may be caused if the needle is inserted into the vein incorrectly, thus the blood is allowed to flow out from the vein and it accumulates under the skin. Haematoma also may occur after phlebotomy, therefore ask the patient to apply pressure on the puncture site until bleeding is ceased.

The following details must be recorded in the ***nursing*** documentation after phlebotomy: the date and time of the procedure, factors affecting phlebotomy (diet, physical activity, medication, drugs, body position), what tests are requested to be performed on the sample, how the patient tolerated the procedure, condition of the skin (e.g. bruised, haematoma), lab test results.

Blood gas analysis

Blood gas analysis gives information about the pH, acid-base balance, carbon-dioxide (CO_2) and oxygen (O_2) concentration of the blood. It can be performed on venous, arterial and capillary (mixed) blood as well.

The imbalance seen in the result may refer to respiratory (pulmonary), metabolic or renal disorders.

Arterial phlebotomy for blood gas analysis
Arterial sample collection by puncture

Arterial blood sample is most often collected from the radial artery, but femoral, brachial and the dorsalis pedis arteries also are used. Indications for sample collection include the monitoring or control of parameters related to artificial respiration or oxygen therapy, such as partial pressure of oxygen and carbon-dioxide, acid-base parameters, or the oxygen transport capacity of the blood. The procedure is contraindicated if any skin lesion, change or inflammation is found at the proposed puncture site; if the patient has a cimino shunt on the affected limb; or in case of peripheral circulation disorders. Before the puncture of the radial artery proper collateral circulation must be verified (by Allen-test). Relative contraindications include anticoagulant therapy and coagulation disorders.

Potential complications

- Bleeding
- Infection
- Arterial spasm
- Arterial occlusion
- Haematoma
- Thromboembolism / aeroembolism

The procedure of arterial blood sample collection

The procedure requires heparinised syringe. There are prepackaged heparin-filled syringes available, or the nurse needs to fill the usually 2-mm syringes with the adequate amount of heparin. The inner surface of the puncturing needle also needs to be heparinized. The size of the needle is usually between 21 and 23 G, however, keep in mind that the procedure will cause inconvenience to the patient, therefore local anaesthetics is also administered before the procedure in some institutions. Feel for the pulsation of the artery with the index and middle fingers, and define the approximate depth and direction of the artery. The puncture site will be between these two fingers, so that the artery will be palpable during the whole procedure. The angle of the puncture is between 30 and 45°, although it also may be affected by the depth of the artery. Arterial blood sample must be used immediately, since results will be unreliable if it is stored at room temperature for more than 15 minutes. Monitor the puncture site for potential complications after the procedure, as well as the peripheral circulation of the affected limb. (Wasserman et al 2005).

Capillary blood sampling

Possible puncture sites are the finger pads (lateral tip of fingers II–IV.), earlobes, or in case of babies the heel. Ask the patient to sit or lie down. First warm up the proposed puncture site to enhance the blood supply of the area. Creams with capsaicin (Finalgon) are used in practice, which cause a hot, prickling sensation. If the proposed site is red and full of blood, lance it for about 0.5 cm deep. Fill the horizontally placed, heparinized Astrup capillary tubes with the flowing blood. Do not squeeze or apply pressure. Make sure that no air bubble gets into the tube. When the tubes are filled, apply dressing on the puncture site and advise the patient to rest. Mix the blood with the heparin in the side of the capillary tube. Place a steel needle in the tube, plug the ends of the tube with your fingers, and move the needle with a magnet. Then seal both ends of the tube hermetically with white caps. Place the capillary tube in the Astrup device if it is available in the ward, or otherwise send the sample into laboratory. Clean up the ward or examination room according to hazardous waste regulations, and document the procedure.

Protocol for capillary blood sample collection

Equipment to be prepared:

- Disposable latex gloves
- Wadding, Gauze pads
- Protecting glasses
- Tubes of the prescribed size and volume with and without additives
- Lancelet
- Capillary tube or filler
- Patient ID label
- Alcoholic wipes or disinfectant
- Sterile gauze sheet
- Sticking plaster
- Hazardous waste container
- Laboratory test request form

Table 2. Capillary blood sampling

	Steps	Explanation
1.	Perform hand hygiene.	To observe asepsis-antisepsis rules.
2.	Identify instructions related to phlebotomy.	
3.	Prepare the room (ward/examination room) for the procedure.	
4.	Prepare the equipment necessary for phlebotomy.	
5.	Perform hand hygiene and put on latex gloves.	In order to prevent nosocomial and cross-infections.
6.	Identify the patient; inform the patient about the necessity and process of the procedure.	It can reduce anxiety and enhance compliance.
7.	Place the patient in the appropriate position: lying on the back or sitting comfortably.	

8.	Warm up the earlobe at the proposed site of the puncture. Rubbing in some capsaicin cream (Finalgon) also enhances blood supply.	To increase blood flow.
9.	Pierce the site with a lancelet.	
10.	Draw the blood into the Astrup capillary tubes without pressing or squeezing.	Make sure that no air bubble gets into the tubes. Hold the tube horizontally.
11.	Place a short steel needle into the capillary tube, then plug the ends of the tube with the fingers, and seal them with plastic caps or plasticine.	
12.	Move the steel needle in the sample to and from with a magnet.	The heparin on the side of the capillary tube will mix with the blood completely.
13.	Place the sample in the Astrup device on the ward, or send the sample into laboratory immediately.	If this is not feasible, the sample can be stored in icy water for maximum 2 hours.
14.	Clean up the patient's environment and provide comfortable positioning.	
15.	Handle any waste selectively.	
16.	Perform hand hygiene.	In order to prevent nosocomial and cross-infections.
17.	Document the procedure and the obtained parameters.	

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32. Protection and Safety Requirements Part 2 Immobility-Syndrome

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Mobility and immobility, the immobilty sindrome

Mobility:

Mobility is the ability of moving freely, including daily activities and the capacity of motion and locomotion. Mobility is an important indicator of health condition, since the freedom of motion is essential for the optimal performance of various body systems. Besides affecting the skeletal system, providing sufficient muscle tone and strength and enhancing energy level, mobility also affects the psychological state of the individual by providing the integrity of the body image.

Immobility:

Immobility is a short or long-term reduction of mobility. Complications (see below) depend on the duration of immobility as well. In case of immobility it is the nurse's task to satisfy the patient's needs, or to assist with the satisfaction in certain needs if functions are partially compensated.

Complete and partial bed rest, and complete and partial immobilisation must be distinguished between. These measures can be initiated as a part of the therapy in relation with several clinical aspects, such as thoracic cases or traumatic injuries, in which cases the aim is to reduce the need for oxygen and to enhance regeneration.

Immobility syndrome is a combination of symptoms resulting from prolonged bed rest, immobilisation or inactivity affecting the whole body and personality (psychological and sociological effects), which are partially reversible by mobilisation and adequate therapy.

Immobility is considered an issue of outstanding importance in nursing. It may occur due to nursing errors that the self-reliance of a patient who would be able to satisfy his/her needs with assistance is restricted by the attending staff, which may lead to severe problems related to immobility, which even may cause the patient's death, e.g. sepsis originating from a pressure ulcer, pneumonia, or even insufficient nutrition. The causes of the former mentioned errors may be varied, such as inadequate training and education, insufficient human resource, lack of time, or burnout syndrome. Immobility syndrome affects the whole of the body, its alterations and the related nursing problems are surveyed below.

Respiratory system

As a result of immobilisation both the respiratory rate and the excursion of the chest decreases due to the pressure of the abdominal organs on the diaphragm, thus respiratory work increases and physical tolerance decreases. The strength of respiratory muscles reduces, as well as the volume and oxygenation of the lungs. Besides, the passage of secretions accumulated in the respiratory tracts and the alveoli also decreases, stasis occurs, and the accumulated secretions serves as an ideal culture for bacteria and other infections that may lead to hypostatic pneumonia and to atelectasia as a consequence.

The mobility of the chest can be preserved with respiratory physiotherapy, the excursion of the chest and the volume of the lungs can be increased, the strength of the respiratory muscles can be enhanced, and secretions can be mobilised and removed (Gerencsér Zs).

In relation to monitoring and assessment of patients, the nurse should measure respiratory rate, observe chest excursion, potential asymmetry and pathological respiratory patterns, listen for stasis of discharge in the alveoli, and check for coughing and sputum during the physical assessment of the respiratory system. If the patient has difficulties or is unable to expectorate phlegm, various methods can be applied to contribute to the mobilisation of secretions. Regarding the effects of inactivity on the respiratory system not only the mobilisation or removal of stagnant secretions can be mentioned, oxygen therapy, drainage of secretions from the lower respiratory tracts and the monitoring of parameters indicating oxygenation, such as oxygen saturation or blood gas parameters (see the chapter on Oxygen therapy) also belong here.

Methods and techniques improving the mobilisation of secretions

The aim of secretion mobilisation is to loosen secretions and to move them towards the trachea from the peripheral

areas. Secretion mobilisation can be performed by aerosol therapy, Flutter, vibration therapy, postural drainage or autogenic drainage.

In case of aerosol therapy 1 or 2-micron particles of mucolytic and spasmolytic pharmaceutical particles administered into the bronchi improve the mobilisation of secretions.

(Berényi T). The aim of vibration therapy is to loosen, tear up then evacuate the secretion stuck to the bronchial walls. It can be performed manually or mechanically. Manual technique includes the clapping and shaking of the patient's chest with the hands. In case of mechanic vibration the optimal frequency is between 12–17 Hz; and it is performed in the direction corresponding to the position of the bronchi, i.e. from distal to proximal. When applying a Flutter (Mucus Clearance Device) exhalation takes place against resistance, and positive expiratory pressure occurs at the end of the expiration phase, which decreases the collapsibility of the airways. Postural drainage is a kind of positioning therapy, a passive technique of secretion transport. Positioning therapy includes various lying positions in which gravity contributes to the clearance of mucus.

Autogenic drainage is a special controlled breathing technique that can be learnt over a relatively long period of time, thus it can be used later in rehabilitation and it demands a high level of co-operation from the patient. The patient can move secretions from the peripheral areas to the central airways by performing inhalations and exhalations of various depths.

Techniques for the evacuation of secretions

Controlled coughing: rapid airflow as a result of forced coughing after taking a deep breath helps evacuate mucus.

Forced expiration technique (FET) means forced expiration by contracting the abdominal muscles, with the glottis open and the chest vibrated, during which the mucus can be moved into the oral cavity. *Expectoration technique* means that the patient attempts to exhale with the glottis closed, after taking a deep breath.

In case of *chest physiotherapy* segmental massage is applied over the lung segment, then mucus is loosened by tapotement technique, then finally it is evacuated with the help of FET.

Chest mobilisation and respiratory muscle training

Breathing exercise improves oxygenation, has an important role in enhancing muscle power, in improving muscular endurance (of the diaphragm, intercostal muscles and accessory respiratory muscles) and chest mobilisation, in the stretching of shrunken muscles hampering respiration and in the prevention of atelectasis. The patient is taught to apply appropriate and efficient breathing types that can ventilate the whole of the lungs. The frequency of breathing exercises is 2x20 minutes daily, and the patient can perform these alone after learning the techniques.

Manual chest mobilisation

In breathing exercises the patient performs chest mobilisation; enhancing ROM by his/her own muscular power, but the chest also can be mobilised by manual techniques or manual therapy the aim of which is to mobilise ribs, stretch shrunken muscles and to enhance the contraction of respiratory muscles. Manual chest mobilisation is recommended to be applied for 2x10 minutes a day.

Muscle training can be enhanced if respiration is performed against resistance. Its techniques include pursed-lip breathing, puffing expiration, sniffing technique, or flexible resistance, mouthpiece and peak flow meter also can be applied.

- *Pursed-lip breathing:* following inspiration, the patient exhales slowly (for 4-6 seconds) with the lips pursed.
- *Puffing exhalation:* after taking a deep breath, slow exhalation with making a "p" sound.
- *Expiration against flexible resistance* also can be applied if the patient is asked to blow up a balloon or latex glove.
- *A peak flow meter* can function as respiratory feedback; the patient is enabled to control respiratory work.
- *Sniffing technique* means a series of taking shallow breath rapidly following normal inspiration.

Circulatory system

As a result of prolonged immobility the circulated volume of blood is rearranged centrally, venous return decreases, which may lead to a stasis in circulation, since, the muscle pump mechanism causing return does not function. The work of the heart is increased. Heart frequency rate is increased, tolerance is decreased. Orthostatic hypotension is common, the reasons of which are the decrease of neurovascular reflexes and muscle tones. Gradual mobilisation is aimed for the prevention of these, and safety needs should be observed strictly.

As a part of the nursing anamnesis and continuous observation, and also before mobilisation the nurse must check the patient's blood pressure and take the patient's pulse. Measuring the blood pressure is important to recognise orthostatic hypotension. The patient needs to be warned to build up gradually, and the patient should be told to report dizziness and weakness. When taking the pulse, its frequency also must be measured together with other qualities. Further symptoms of circulation failure include oedema of the limbs, the most frequent site of which are the legs, feet, arms, forearms and sacrum due to gravity. For details of nursing interventions related to the circulatory system such as taking the pulse and blood pressure, see the chapter on vital parameters.

Thrombosis Prophylaxis

Haemostasis is the capacity of the body to keep the circulating blood within the blood vessels and in case of the injury of the veins it mobilises protection systems. These capacities are ensured by the harmonic co-operation of the vessel walls, the thrombocytes and the coagulation system.

In clinical aspects you may encounter thromboses affecting the arterial or the venous system; the symptomatology, diagnostics, therapy and prophylaxis of these differ.

Clinical practice and several domestic *(Magyar Thrombosis Társaság, Balikó et al.)* and international *(Adams, Brott; Ansell, Hirsch)* researches have proved that besides the application of prophylactic methods, the recognition of the symptoms of developed thrombosis has a great significance in shortening the hospitalisation period of the client.

Diagnostics

- Physical examination
- Duplex-Doppler
- Venous occlusion plethysmography
- Phlebography (venography)
- Spiral CT and MR
- Laboratory examinations

The indication area of thromboembolism prophylaxis is wide-ranging, it may be required in almost all clinical fields. The methods applied in the prophylaxis of thromboembolism differ from the therapies applied in treating developed thromboses. Mechanic methods of thromboembolism prophylaxis are contraindicated in cases of deep venous thrombosis in progress and acute thrombophlebitis. Several clinical observations have proved the necessity of thrombosis prophylaxis in case of permanent or temporary immobilisation, which is regarded as evident today.

Mechanical methods in thrombosis prophylaxis

Positioning

Trendelenburg position

Positioning of the lower limb in lying position

In supine or side-lying position; the lower limb is placed higher than the level of the heart. Surveys on the positioning of the legs show that the flow rate of micro-circulation in the lower limbs is increased by 45% as a result of positioning, while it is even more efficient when complemented with compression therapy and/or massage therapy (Collins L, Seraj S, Abu-Own A, Scurr JH, Coleridge Smith).

Massage

The deep smooth strokes of classic Swedish massage and intermittent massage can be used for enhancing venous circulation.

Compression therapy

Physiological effect: flow rate is increased by decreasing the lumen of the veins, which helps venous return, reduces the pathological pressure on vessel walls and the venous stasis and improves muscle pump function.

The application of elastic compression – education on the application of elastic stockings and bandages

Elastic stockings are medical devices for the treatment of the dilatation of superficial veins of the legs or for the prevention of deep venous thrombosis by decreasing venous pressure and oedema and increasing the flow rate in deep veins. Their shape depends on the intended effect – e.g. mid-thigh, below-the-knee stockings, tights, or socks, depending of the area of the leg to be treated.

Compression stockings are only effective if their compression force is bigger on the distal part, gradually decreasing towards the proximal area, and this principle also applies to the application of elastic bandages, therefore the education of patients and relatives is extremely important. Compression stockings are easier to use, but compression bandages are recommended in case of venous decompensation until significant oedema reduces, and in case of leg ulcers. (Kaplan 2002)

Medical stockings are available in four compression grades and they have two basic types depending on compression grade: medical compression stockings and support stockings.

Medical stockings can be divided into four classes based on their compression power. The lowest-grade stockings exert 15–21 mmHg, grade II stockings 23–32 mmHg, grade II stockings 34–46 mmHg, while grade IV stockings exert over 49 mmHg on the venous circulation of the limb, thus improving venous return.

Several researchers *(Roche-Nagle, Winslow)* have drawn attention to the proper use and size of the compression stockings to avoid skin injuries, the development of thrombosis and further complications, as well as to enhance clients' comfort.

Passive osteokinetic mobilisation, passive mobilisation

Definition: the patient is relaxed during mobilisation, which is caused by external forces; i.e. the mobilisation of the patient's joints without the patient's muscular activity (Reichel, Groza-Nolte). Passive mobilisation at a higher rate, in a big ROM (range of motion) with a high number of repetitions (12–18) enhances venous circulation.

CPM – continuous passive motion devices

In the use of mechanical motion devices, the limb is fastened to moveable rails with bands. The duration, speed and range of motions can be adjusted. It is important to adjust the rotation axis of the joint accurately for adequate anatomical motions.

Suspension frame

The patient is suspended in a special position in a suspension frame (picture 1). Moving can be performed by the therapist, or the patient can move inactive lower limbs with the upper limbs, thus moving the lower limbs passively.

Active exercise

Venous exercise

Venous exercise is based on physiological processes contributing to the return of blood, such as muscular pump function and negative thoracic cavity pressure. Muscular pump function, contracting muscles, m. soleus, m. triceps surae exert pressure on venous walls, the veins among muscles are pressed, and blood flow is increased. As a result of inspiration abdominal overpressure and negative pressure in the chest cavity occur, which dilates the thoracic veins and has a suctioning effect on the distal veins (Silbernagl-Despopoulos). The elements of venous exercise are isometric contraction, isotonic concentric contraction, complex movements of the major joints and costodiaphragmatic breathing. Isometric contraction is performed in a proximal-distal direction, the aim of which is the emptying of the veins. Its recommended frequency is 14-16 contractions/minute (Katona, Siegler).

Consensual response effect

Consensual effect is a change perceived in the corresponding segment of the contralateral symmetric body part when treating a part of the body. Its physiological background is that consensual reflex-effect emerges on the same nerve tract, with the same spinal innervation or by cerebral feedback.

Lying bicycle, ergometer, bed pedal

Exercise for enhancing circulation also can be performed in bed, not only for improving circulation but complete cardio-training as well, so the muscles of the heart can be trained and cardio-respiratory endurance can be maintained. The increase of resting pulse rate can be prevented by cardio-training, resting heart rate can be decreased by the improvement of cardio-respiratory endurance and by training the muscle-system of the heart.

Subaqueous motion, hydrotherapy

In hydrotherapy the diameter of the veins decreases and venous blood flow rate increases due to hydrostatic pressure. By submersion to the suprasternal notch central venous return is increased by 700 ml, and arterial volume is increased by 34%. Transmural pressure of the limbs increases, diameter of the veins decreases, and venous return is accelerated.

Mobilisation

Early mobilisation

Early mobilisation can mean the early waking, sitting, standing or walking the patient, as well as a gradually increased range of controlled autonomous and self-supplying activities. The aim of early mobilisation is the prevention of complications originating from immobility and physical and psychological deconditioning. Early mobilisation has different rules and prescriptions in clinical practice and in case of various diagnoses, besides the general rules of mobilisation.

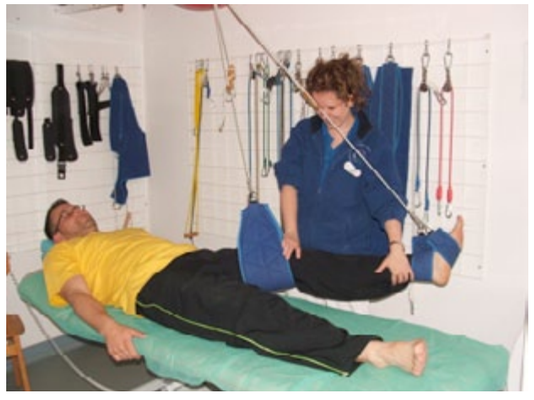
General mobilisation principles

The principles of early mobilisation are included in professional protocols. Mobilisation must be implemented gradually and it can be altered depending on the actual condition of the patient. Only simple and small movements should be performed at first, then the level of self-supplying can be improved gradually, and the patient should be encouraged to this. Depending on his capacity, the patient needs to take part in satisfying his own hygienic needs, e.g. in washing himself, in toilet use and in eating. From the part of the nurse continuous observation before and during mobilisation and monitoring vital parameters are essential, and extreme attention must be paid to orthostatic hypotension. In the case of surgical operations the operating surgeon determines the initiation time and the degree of mobilisation.

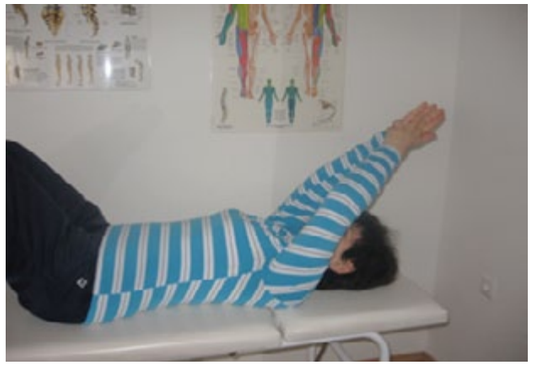
Devices enhancing standing or walking include walking frames, rolling walkers, rollators, rolling walkers with underarm support, rolling stands, underarm crutches, elbow crutches, and one- or multi-footed sticks. Before walking the patient is made to perform preparatory exercises that include exercises for improving muscular power required for walking, joint mobilisation exercises to develop the range of motions necessary for walking, and balance, co-ordination and synkinetic (alternated simultaneous movement of contralateral arm and leg) exercises.

Before walking it is important to achieve and learn the right posture. Posture is appropriate if the ear-shoulder-hip-ankle line is straight from the side. Posture is also influenced by the correct adjustment of the device, corresponding to body height. Basic principles for the adjustment of devices: in case of sticks, crutches and walking frames the height of the handgrip must be level with the hip joints and the patient's elbow must be slightly flexed so that appropriate force can be exerted by the upper limbs and posture can be correct during walking.

When walking on flat surfaces, the correct order of the limbs and the device is the following: device, injured leg, intact leg. First the device is put forward, then the injured limb depending on the allowed tolerance, and finally the intact leg steps forward. Walking upstairs: device, injured leg, intact leg. Walking downstairs: intact leg, injured leg, device.



32-1. ábra. Függesztőrács-kezelés



32-2. ábra. Automobilizáció

32-3. ábra. Állítógép

Pharmaceutical prophylaxis in thrombosis prophylaxis: the application and education of LMWHs and oral anticoagulants

LMWH (low molecular weight heparin)

With the emergence of low molecular weight heparins the implementation of thrombosis prophylaxis and the treatment of deep venous thrombosis have become easier and safer. LMWH molecules are heparin fragments weighing 4000–5000 Daltons on average. Maximum plasma-concentration is reached 3–5 hours after administration.

Oral anticoagulant therapy (coumarins)

Oral anticoagulants (coumarin-derivatives) are widely used pharmaceuticals. They are vitamin K antagonists, that is, they inhibit the synthesis of vitamin K-dependent coagulant proteins. Their most important indications include secondary prevention of venous thromboembolism, arterial embolism and stroke prevention in cardiovascular clinical aspects.

Interactions with medicines, food and medical conditions

Certain pharmaceuticals, food components and medical conditions can increase or reduce the effect of coumarins *(Büller, Kaplan, Laporte),* this interaction can be attributed to the inhibition of coumarin metabolism.

- amiodarone
- barbiturates, carbamazepine, rifampin
- thyroid hormone replacement drugs
- salicylates and non-steroidal anti-inflammatory drugs
- food containing vitamin K
- herbs against liver stagnation
- hyperthyroidism

Operation planned besides coumarin therapy; directives for measures

The necessary prophylactic intervention is determined by the magnitude of the operation and the risk of bleeding and thrombosis. According to the recommendation of the Magyar Thrombosis Társaság [Hungarian Society of Thrombosis] the administration of coumarin should be stopped four days before the intended operation, however, it must be continued as soon as possible after the surgical intervention – either on the same day, or on the first post-operative day.

The magnitude of operations: In case of minor operations if the risk of thrombosis is not high, the first two doses following the operation must be doubled. If the patient's INR is below 2, or medium or major operation is to be performed, subcutaneous heparin or LMWH can be administered.

In the case of oral anticoagulant therapy a significant role of the nurse is to provide the patient with information about the necessity and the appropriate conditions of the medication, the risk of potential interactions, the importance of

providing information prior to invasive interventions (dental, surgical interventions) and the significance of a diet with appropriate vitamin K content based on the above mentioned points (Boda és mtsai, Ansell és mtsai). Being aware of this information, the patient will be able to recognise the symptoms of possible complications, and will be informed with regard to the therapy.

Locomotive system

As a result of immobility atrophy of the muscles can occur; both their volume and the muscular tone decreases. Lack of mobility implies the contracture of joints, which may lead to ankylosis in severe cases. A further complication is that the calcium content of bones decreases due to lack of activity, therefore consequential osteoporosis may occur. Within the assessment of condition the motion range of joints and muscular strength need to be defined, the posture and the actual position of the patient needs to be observed, because these parameters serve as a basis for correlation during further revisions.

Contracture prophylaxis

The development of contractures can be prevented by positioning, passive mobilisation and teaching active exercises as soon as possible.

Passive osteokinetic mobilisation

Continuous, slow (5-8 seconds/motion), full-range passive mobilisation has a ROM-maintaining and enhanced tone-loosing role. For the prevention of contractures passive mobilisation is advised three times a day.

Positioning

In case of positioning with the purpose of contracture prophylaxis the patient is positioned in accordance with the Janda-Lewit-Sachse system, providing a stretched position for muscles inclined to shrinking and shortening (see decubitus prophylaxis below). In positioning the major joints the degree and frequency of the alteration of position is significant, e.g. in case of side-lying the arm closer to the bed must be in a stretched position in front of the chest, then flexed in front of the chest, while the other arm is resting on the trunk, then is stretched in front of the chest, then flexed in front of the chest, then is stretched in front of the face.

Active ROM exercises, automobilisation

Patients can perform active joint mobilisation exercises even with relatively low muscular power. At grade-2 strength the patient is unable to move his limbs against gravity, but being slid on the bed or on the exercise board is capable of autonomous movement. If friction resistance is still too difficult to overcome, movements can be eased by the use of talcum.

Muscle atrophy prophylaxis

The flexibility of muscles, tendovaginas and capsular ligaments of unconscious patients can be preserved by *passive mobilisation and massage.* More forceful stimulating manipulations are recommended, such as rubbing, kneading and tapping.

In case of co-ordinating patients muscular contractility and the maintenance of the reflex-apparatus function can be achieved by *mentally experienced passive mobilisation*. This means that during passive mobilisation the patient is asked to try to perform the exercise, and in this case small vibrations can be experienced which indicate muscular activity at grade-1 muscular strength.

Innervation exercises can be performed in permanent plastering to prevent muscular atrophy. The patient is asked to tense and relax the muscles under the plaster. The duration of tension is 2-10 seconds, and the time between two tensions is 5 seconds. Contraindication: static tension over 4 seconds in case of hypertonia.

Today modern devices are available for providers with which the movement of the patient within the institute can be followed accurately, enhancing the safety of patient care. The main component of the system is a signalling device fastened to the patient's wrist which looks like a watch, and a receiver which is usually placed in the nurses' counter. The wrist-sensor which is continuously worn by the patient perceives the patient's movement, low and high activity levels (changes of position, movement, immobility, unconscious state), and displays these graphically, which can be displayed on a central monitor. Body temperature also can be measured, and a further property of the device is the stray alarm. This means that if the patient is approaching the door in the ward, a sensor locks it automatically and it only can be unlocked with a key. With this system the risk of accidents can be reduced, together with accident-related costs. The burden on nurses also decreases, patient identification systems can be improved, medicine intake and the use of the medicine storing room can be monitored. Besides, the application of the system enables the management to supervise and control the process and quality of patient care based on objective parameters. This is because the performance, time and duration of necessary nursing interventions can be monitored, e.g. satisfying hygienic needs or mobilisation related to decubitus prevention (e.g. the repositioning, turning of the patient at the necessary time) (Tóth A).

Integument; decubitus prophylaxis

Due to immobilisation the increased tissue pressure results in the local deprivation of oxygen in the tissues, i.e. decubitus, especially over bony portions. Besides individual factors, in the development of pressure ulcers also known as an indicator of the quality of nursing the body weight and nutrition of the patient (sufficient protein intake), hydration, the presence or absence of incontinency or any other factor promoting the disintegration of the skin (objects left in the bed, creased bed-clothes) are also determining factors. Pressure-minimising devices play a significant role in the prevention of pressure ulcers, besides regular mobilisation. About the evolution of pressure ulcers, further possibilities of prevention, special pressure-minimising devices and intelligent dressings see the chapter on Wound management. In maintaining the integrity of the skin proper skin care plays a significant role, however, immobilised – or unconscious – patients are unable to satisfy their hygienic needs by themselves, therefore it is the nurse's task to perform everyday hygienic tasks. It is important to note that during the performance of these tasks the nurse can obtain information about the condition of the skin and has an opportunity to notice any potential changes on the areas under increased pressure. About hygienic care and the bathing of immobilised patients see the chapter on Hygienic care.

Frequent repositioning and mobilising

The turning of passive patients is recommended every 2 hours with the techniques of atraumatic positioning, with the exercises of Dotte's or Bobath's techniques (for details see the chapters on Protection and safety needs, Lying, positioning, comfort devices, mobility devices and Physiotherapy).

Positioning has a role in the stabilisation of the posture in between locomotive and other motions. Common support pillows, towels folded into various shapes and sizes, sandbags, special pillows and lying devices can be used for positioning.

Basic principles of lying positions

The following issues must be observed in determining lying positions: joints must be in ROM-medial position, positioning must contribute to venous return, according to the Janda-Lewit-Sachse system muscles inclined to contracture must be stretched, while muscles inclined to over-stretching must be in a shortened position.

The specific rules of lying positions are determined by the pathokinesiologic and biomechanical aspects related to the disease. The positioning of post-stroke patients is determined by the Wernicke-Mann pathologic pattern, according to which the upper limb is inclined to increased tone in the flexional direction, while the lower limb in the extensional direction. Therefore the upper limb is positioned in extended position, while the lower limb is in flexed.

Special devices are available for decubitus prevention, such as special beds (sand beds, air beds, sandwich beds with motors, kinetic therapeutical beds), seat cushions and anti-decubitus mattresses. In air-beds a kinetic mattress provides alternating pressure.

Sitting cushions are designed to keep the pelvis and the lumbar spine in the proper position, and to provide an even distribution of pressure. "Gyopár" rings and seat cushions for wheelchairs are absorbent, fastening and pressure-redistributing due to their beady filling.

Anti-decubitus mattresses can consist of foamy materials moulding to the shape of the body, thus reducing the pressure exerted on one point. Viscoelastic mattresses improve the redistribution of pressure by the shifting of the gel. Egg-crate mattresses provide for alternate pressure.

Venous exercise contributes to decubitus prevention by increasing venous flow rate and improving the micro-circulation of the skin. (About the physiological basics and details of venous exercise see above: thromboembolism prophylaxis)

Arterial interval exercise training enhances arterial circulation. Arterial exercises are performed on a bed in supine position, with the lower limbs elevated. As a warm-up, isometric and isotonic exercises are performed, then interval training, and finally breathing exercises together with the movement of the upper limbs.

Muscle and ROM training

The patient is assisted with exercises enhancing muscular strength, the range of movements, co-ordination and balance according to the patient's capacity to enable him to move autonomously and to develop balance for sitting up and standing as soon as possible (for details see the chapter on Physiotherapy).

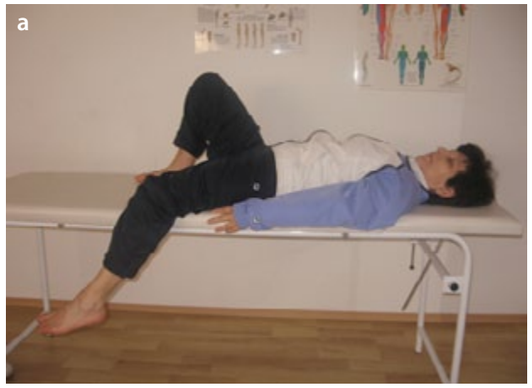
Electrotherapy

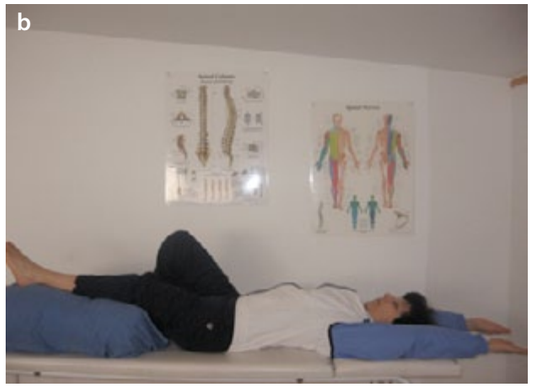
Low frequency therapy have an effect on vasomotoric nerve fibres, thus they enhance circulation (Bender T, Muraközi H).

Galvanic treatment also can be applied with the aim of enhancing circulation at 0,1–0,2 mA/cm$^{2.}$ with a duration of 15–20 minutes.

Changes in the digestive system and metabolism

The functioning of the gastro-intestinal system slows down, absorption and metabolism is corrupted and appetite is re-





32-4. ábra a, b. Artériás értorna

duced due to immobilisation. Due to changed protein metabolism negative nitrogen balance may develop which has a deteriorating effect on developed or developing pressure ulcers. Intestinal peristalsis decreases, and constipation occurs – also because of the changes of the metabolism and the lack of activity. If decreased peristalsis and constipation cannot be cured, this condition can progress into mechanical ileus worsening absorption.

It is essential to carry out certain anthropometric measurements during nursing such as the measurement of body height, weight, skin fold test, BMI (body mass index) and the diameter of the upper arm. These data refer to nutrition. The balance of fluid intake and output, electrolyte and vitamin supplementation are also important. Oral intake must be preferred in each case when possible, but enteral or parenteral supplementary feeding also can be carried out if necessary. About the basics of nutrition, feeding, feeding probes and their proper application see the chapter on Nutrition. Concerning the gastro-internal system, defecation habits also must be assessed. Information needs to be obtained about the frequency and consistency of stool, and if the patient has problems with defecation, gradualness must be observed during the therapy. The chapter on Defecation describes the nursing interventions related to the digestive system such as the observation of the properties of the stool, special examination processes, the treatment of diarrhoea and obstipation, laxative and enema types, and sample collection methods.

In case of *diaphragmatic breathing* the diaphragm moves toward the abdominal cavity, thus mobilising and massaging the organs of the abdominal region which has a positive effect on the gastro-intestinal system. Abdominal breathing exercises including slow inhalation and exhalation are recommended to be performed 10 times an hour.

The active exercises of the lower limbs and the trunk also affect the abdominal organs. Hip flexion movements exceeding 90 degrees also move the abdominal organs. These exercises can be performed in lying, sitting and standing positions and during walking as well.

The *classic Swedish massage* can be applied on the portion of the abdomen. Vibration, flat shaking, smoothing and kneading can be performed in the direction of the colon, from the sternum and the lower ribs to the symphysis and the crista iliaca (See the Physiotherapy chapter).

The urinary system

Renal blood flow is increased as a result of immobilisation and the activation of the parasympathetic nervous system, thus more urine is created and evacuated. A part of the calcium released from the bones gets into the filtrate, which increases the risk of the development of nephroliths, which is further increased by the stasis of urine. Urine stasis and retention caused by the decreased muscular tone of the bladder implies a risk of urinary infections.

In case of immobility sufficient fluid intake and monitoring of the fluid balance also are important (see the chapter on Infusion therapy). Concerning urination, it is important to enquire about its way (e.g. urine pots or permanent catheter), frequency, potential pathological changes such as incontinency, since these have a determining effect on the patient's convenience. About potential nursing problems connected to urination and related nursing interventions, such as incontinency, urine examinations, sampling methods and bladder catheters see the chapter on Urination for details.

Nervous system

In case of immobility peripheral nerves receive continuous negative stimuli, therefore these nerves are damaged after a certain time. Initially patients can experience pain when lying in bed, but with neural damage this is lost, that is why it may occur that even co-operating patients do not report decubitus development due to the loss of sensation. Besides these, movement and balance disorders also must be taken into account before mobilisation.

Psychological effects

Prolonged bed rest causes psychological changes in the client's condition as well, which may originate from hospitalisation, changes in self-regard and the image of the self. It is difficult to cope with and overcome the dependent situation which means that the patient is unable to continue with a previously autonomous lifestyle. Stimulus-deprivation, the decreasing of social interactions and the changes of the sleep-awake cycles contribute to the development of apathy and depression. Relaxation exercises can reduce the psychological effects of immobilisation.

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33. Physiotherapy

BY MELINDA JÁROMI

Physiotherapy

Physiotherapy uses natural energies, which are chemical (thermal water, medical fields), mechanical (active muscle functioning), heat (solar light, infrared radiation, thermal water), magnetic, electrical and nuclear energy (photons, radioactive thermal waters), in their original form or in an artificially produced form, to cure. The expression 'physiotherapy' also refers to this, it is derived from the Greek word 'physos' and it means nature.

In English-speaking areas physiotherapy is referred to as *'physical therapy, physiotherapy'* (abbreviated as PT), in German-speaking areas it is called *'Krankengymnastik.'*

Physical therapy represents a smaller therapeutic portion within physiotherapy. Physical therapy includes the methods where only physical energy is used for treatments; electrotherapy, mechano-therapy, thermotherapy, hydrotherapy and phototherapy can fall within its range.

The methods of physiotherapy

According to the traditional classification, the therapeutic methods belonging to physiotherapy can be grouped on the basis of energy intake during treatments. The classification published in Germany in 1986 differs from the traditional grouping regarding some of the therapies. In the English-speaking world physiotherapeutic treatments are divided into passive and active therapy. If the patient does not cooperate actively in the therapy, it is referred to as passive therapy, such as laying methods, the passive moving of the patient by the therapist, massage, electrotherapy, manual therapy.

Active techniques involve techniques upon the application of which joint motion is created by the voluntary work of the muscles against external forces, for example by doing gym exercises, or developing a healthy lifestyle, participation in therapies related to lifestyle changes, or e.g. the 'backschool' spine school program that teaches correct posture and spinal use.

Electrotherapy

Within electrotherapy small, medium and high frequency treatments are distinguished (Figure 1).

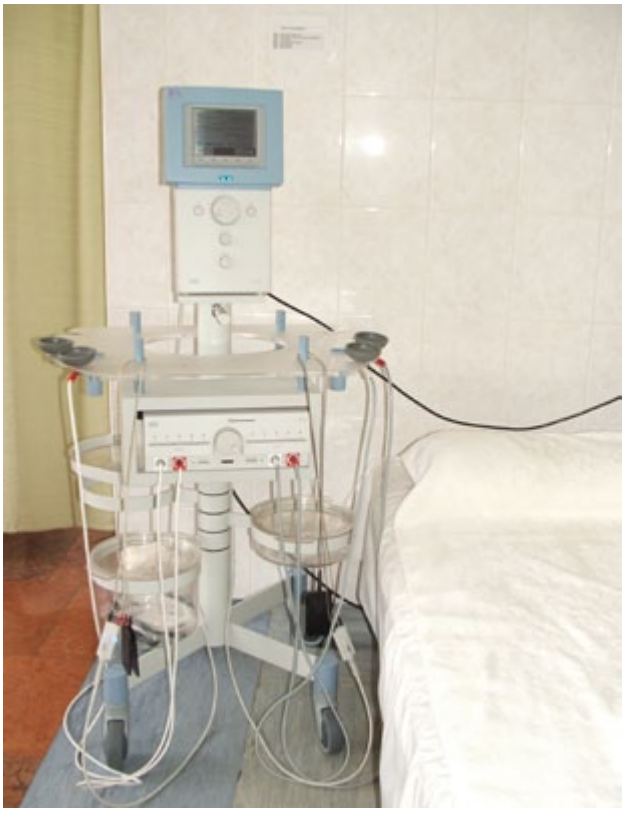

Figure 1: Electro-therapy treatment room

Low-frequency treatments

Low-frequency treatments fall in the frequency range of 0–1000 Hz, they include galvanic treatments and electrical stimulation treatments. The stable galvanic treatments have pain relieving, circulation increasing, hyperemesic effects. When applying special galvanic treatments, the shape of the electrodes or the the type of the treatment is special. Riesz's calcium stasis, the Kowarschik, Bergonier, Bourginon treatments are special galvanic treatments.

Iontophoresis or electrophoresis

During an iontophoresis or electrophoresis treatment electroosmosis is created on the skin, as through a semipermeable membrane, in the course of which process medicine dissociated to anions and cations can be placed into the body with small and medium-frequency current.

Within the scope of *selective electrical stimulation* therapy direct and indirect treatments can be done. With direct stimulation modes, with bipolar therapy, muscle tissue stimulation

can be performed. With indirect modes of treatment, the muscles are stimulated through the nerve by the placement of a unipolar electrode. Selective electrical stimulation therapy begins with electrodiagnostics, during which I/t graph is made and the treatment parameters are obtained. The operational parameters, the duration of the stimulus, the stimulus rise time and the interval between stimuli must always be appropriate to the state of the given muscle, with which visible muscle function can be induced while treating the muscle, using the minimum electrical current level. Selective electrical stimulation treatment can be used to stimulate smooth and striated muscles. Bladder and rectum stimulation can be done in case of bladder atony, incontinence, obstipation and paralytic ileus. In case of healthy striated muscles, selective electrical stimulation treatment is used as electro-gymnastics for the prevention of muscular atrophy. Many times the patient himself gives the stimulation with the help of a push button and this way he is involved mentally as well, in creating the muscle activity. Selective electrical stimulation treatment is done therapeutically with muscles that are weaker than third degree muscular strength and are damaged in their innervation.

Electrical stimulation

With electrical stimulation treatments, such as Leduc-current, Neofarad-current, Traubert's stimulation current and diadynamic current, pain point treatments, ganglion treatments, segment treatments and muscle stimulation may be performed.

Figure 2: **Partitioned hydrogalvanic treatment**

Transcutaneous electric nerve stimulation (TENS)

Transcutaneous electric nerve stimulation (TENS) primarily has pain relieving and circulation enhancing properties. The impulse form of TENS is always of short duration and angular, even if singular impulses are given and also if the patient receives the impulses in groups (Burst's treatment, in which the enveloping graph is exponential). It can also be used to relieve pain in case of malignant tumors.

Hydrogalvanic treatment

Hydrogalvanic treatment merges the effects of electrotherapy and hydrotherapy. During hydrogalvanic treatment the physical effects of the galvanic current and the bath water and the chemical effects of the additive substances become effective. The treatment is of pain relieving, vasodilative and circulation enhancing effect. The full and phrenic galvanic treatments are types of hydrogalvanic therapy (Figure 2).

Indications: polyneuritis, rheumatoid arthritis (RA), ankylosing spondylarthritis (Bechterew's disease, SPA), myalgia.

Contraindications: acute arthritis, cardiac decompensation, ischemic heart disease, gravidity, pacemaker, prosthesis, a metal body in the organism, tumour, arteriosclerosis, osteomyelitis.

Mid-frequency treatments

Mid-frequency treatments apply 1000 to 100000 Hz. During an interference treatment two electric circuits are crossed, four electrodes are used, the treatment is performed with sinus waves descending and ascending in the same phase. In the course of interference treatments deep effects are created by the crossing of mid-frequency electric currents which have the effect of smooth muscle stimulation, relieving pain and an effect causing local hyperaemia by the alternation of vasodilatation and vasoconstriction. Two types of mid-frequency treatments are used, namely Nemec's traditional and the amplitude modulated mid-frequency treatments.

Magnetotherapy

Magnetotherapy, during magnetic treatments continuous and impulsed magnetic fields are used. As a result of magnetotherapy joint and paraarticular inflammations are reduced and the intensity of muscle contraction increases. Magnetic therapy helps dissolving myogenic contracture and the assimilation of calcium into the bones.

High-frequency treatments

High-frequency treatments (over 100000 Hz): their effect mechanism is based on the endogenous generation of heat that results in vasodilatation, hyperaemia, increased local metabolism and histamine-like substances are released. The types of treatment are: short waves, decimeter waves and microwaves.

Phototherapy, heliotherapy

Phototherapy means a treatment with light, heliotherapy is sunlight therapy or artificial sunlight therapy, consisting of laser, infrared (30000–760 nm), ultraviolet (400–200 nm) and visible light therapy (760–2200 nm). Infrared therapy enhances vasodilatation, dissolves spasms, has a fibrolytic effect and helps the tuning of the autonomic nervous system to a parasympathetic direction. Infrared therapy is also used as a warm-up therapy prior to the passive outward moving of the patient and massage therapy.

Hydrotherapy

Hydrotherapy uses the physical properties of water (buoyancy, drag, hydrostatic pressure, temperature) for healing. Hydrotherapy treatments include bath treatments of different temperature (hydrothermotherapy), pourings, ablutions, compresses. For patients with multiple sclerosis (MS) motion in warm water and heat treatments are contraindicated because according to the Uthoff sign, the symptoms may get exacerbated.

Underwater gymnastics and underwater jet massage can be classified as types of hydromechanic therapy. Underwater jet treatment (Figure 3) is an underwater jet massage, which is done with water, the temperature of which being 34 degrees Celsius and its atmospheric pressure being 0.5 to 1.5. Indication: relaxing the connective tissue and the muscles.

Figure 3: **Underwater jet massage treatment**

During movements done in subaqual space, the ascensional force helps the exoneration of the joints and the spine. If the limbs or the whole body is laid on the surface of the water, passive and guided active movements can be carried out, for the purpose of which different assets, like swimming boards, water dumbbells, foam rods, water wall bars, can be used. The resistance of water is used for muscle strengthening exercises, we do training against resistance for example with a swimming board, water dumbbells or resistance gloves. Hydrostatic pressure helps to enhance the venous circulation and to reduce oedema. With balance and walking exercises there is "more time" for loss of balance and regaining balance in subaqual space, so patients with balance and coordination problems move more easily and safely. Water also helps the development of correct posture and to stabilize the joints. As a result of the ascensional force, the body weight relatively decreases, consequently it is practical to do the initial movement therapy for obesity in subaqual space, so the extra weight does not burden the spine and the large joints.

Thermotherapy

During thermotherapy heat supply (heat therapy) or heat removal (cold therapy) occurs.

Analgesic, antiflogistic effects, muscle tone enhancement and vasoconstriction can be achieved with cold therapy, and the local blood flow and the rigidity of the connective tissue is reduced.

Cryotherapy

Cryotherapy is a treatment carried out at temperatures below 0 degree Celsius. Cryotherapy has an effect of raising the pain threshold, it relieves pain by blocking the Delta and C fibers, it has an anti-inflammatory effect by inhibiting serotonin and bradykinin release, besides it inhibits bleeding and oedema and helps dissolving spasms. Cryotherapy is used for centrally paralyzed patients before beginning movement therapy since spasms are dissolved and the movement therapy is more efficient this way.

Cold therapy

Cold therapy may be short, fast-acting and long term, requiring long-term treatments, such as rubbing with ice, cold, wet compresses or cold hose, Leiter's kind of cooling, or treatment performed with cryogel or liquid nitrogen.

Indication: pain relief after an injury, contracture pretreatment, mitigation of a sterile inflammation, first stage of Sudeck's syndrome spastic paresis, dissolving spasms, MS.

Contraindications: sensitivity to cold, cardiac decompensation, nephritis, cystitis, cold hemoglobinuria, the treatment of the left shoulder of a patient with angina pectoris.

During a cryotherapeutic treatment the passive movement of the patient is forbidden.

Heat treatment

Heat treatment has pain relieving, vasodilative, hyperaemia causing, muscle tension reducing, fibrolitic, antiflogistic (in

chronic inflammations) effects. Heat treatment can be dry hot compress, pack, paraffin treatment, parafango pack, mud compress treatment, hot-air bath, steam bath, sauna, spa treatment.

Indication: chronic arthritis, post-accident treatment.

Contraindications: acute, subacute inflammation, thrombosis, thrombophlebitis, MS.

Mechanotherapy

Mechanotherapy has an active and a passive part. Active mechanotherapeutic treatments are physiotherapy, passive mechanotherapy includes massage, traction, traction bath, ultrasound treatment.

As a result of traction and extension treatments, the joint surfaces get away from one another, the joint space, the intervertebral gap is growing. The treatment has a pain relieving effect. If the passive movement of the patient is painful, then by applying traction, the treatment can be carried out in a pain-free manner.

Traction can be performed manually or in suspension. Gravity pulling can be used on an anti-gravity stand (Newton-pad), where the patient does traction with his own body weight, using the force of gravity. The patient is lying on his back on a tilted bed, fastened to the bed by his ankles, then while tilting the bed, the head end of the bed is getting lower and lower, if necessary, until the patient's body gets into a vertical position.

Glisson's cervical traction therapy (Figure 4) is used for the treatment of cervical discopathia, torticollis, thoracic outlet syndrome (TOS). It is carried out with a special neck traction device, while the patient is sitting or lying in a slant position.

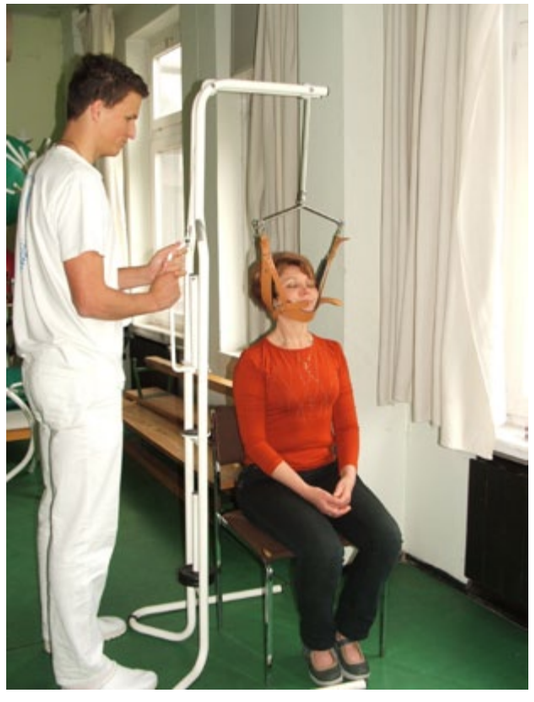

Figure 4: Glisson's treatment

There is a bed-mounted traction unit device, which consists of a pulley system and weights. It is applied in case of degenerative spine diseases, coxarthrosis, gonarthrosis for the purpose of pain relief and before a scoliosis surgery it is used in order to achieve the highest degree of spinal mobility.

Underwater traction, weight bath are used for the extension of the spine and the large joints of the lower limbs.

Indication: discopathia, spondylosis, neuralgia intercostalis, neuromuscular compression syndrome, coxarthrosis, gonarthrosis.

Contraindications: cardiac problems, hypertension, mental illness, incontinence, fever, acute musculoskeletal disorders, infectious diseases, MS, DMP, tumours, acute radiculitis, acute spondylolisthesis.

Within *massage therapy* classic Swedish massage, reflex massage, periosteal massage can be applied. The classic Swedish massage may be performed as sports, hygienic or healing massage.

Ultrasound therapy

Ultrasound therapy is physiologically based on micro-massage and endogenous heat generation, as a result of which vasodilatation and hyperaemia occurs. The epithelial structure of the skin and the connective tissue loosens. Ultrasound therapy has spasmolitic, fibrolitic and analgesic effects.

Sonophoresisl

In the course of ultrasound therapy drugs with diluted consistency and with a low molecular weight drugs are brought into the body.

Balneotherapy

Balneotherapy uses the chemical effects of water for treatments. The internal and external applications of thermal mineral waters, spa and drinking courses of treatments are included in balneotherapy.

Climatic therapy

Climatic therapy makes use of the beneficial influence of climates and typical weather conditions on diseases, which are used for healing.

Speleotherapy (cave therapy)

Speleotherapy (cave therapy) is a special form of climatic therapy. The temperature is 40 degrees Celsius in hot caves, the recommended length of stay there is 30 to 40 minutes. Warm cave therapy has a vasodilative effect and it dissolves spasms. It is primarily used for curing musculoskeletal disorders.

Figure 5: Cave sports therapy

Cold caves are primarily suitable for the treatment of respiratory diseases, like bronchial asthma. The length of stay there is 4 to 6 hours a day, as a course of treatment.

Cave sports therapy

During cave sports therapy (Figure 5) speleotherapy and kinesitherapy are applied in combination. Asthmatic children go on cave tours with a tour guide and this way they pursue active sports for several hours in the climate of a cave. Movement-wise cave tours typically include crawling, climbing through the narrow paths of caves, which has a significant back muscle strengthening effect.

Inhalation treatments

During inhalation treatments air ions, healing waters and drugs are brought into the airways.

Aerosol therapy

In the course of aerosol therapy water with pulverized regular salt, water with iodine, mineral water containing calcium or solutions of drugs are used. Their effect increases airway secretion, helps the mobilization of secretions and reduces inflammation. The drugs used in aerosol therapy have broncho-, muco-, secreto, spasmolitic and antiflogistic effects.

Aeroiontherapy is an air bath treatment through which negative ions are brought into the body. As a beneficial result of negative ions pulmonary ventilation improves, the oxygen saturation of the blood increases, the general state of health and well-being gets better.

Medical gymnastics

Medical gymnastics is part of mechanotherapy. The most widely used group of movements in the movement system of medical gymnastics are the single phase and two-phase exercises, as well as the analytic, combined and complex exercises.

The purpose of medical gymnastics is the preservation or restoration of muscle balance. In their Muscle Disbalance system Lewin, Sachse, Janda list skeletal muscles into two functional systems, namely to muscles susceptible to (1) hypotone and to (2) hypertone. Due to immobilization, one-sided load, lack of movement, the normal muscle balance disintegrates and muscle disbalance comes into being. In case of muscle disbalance muscle, the muscles prone to hypertone shrink and shorten, the muscles susceptible to hypotone stretch and weaken.

In defining muscle strengthening exercises in medical gymnastics the main types of muscle activity types are used. We speak about isometric muscle activity when a muscle is active, but the origin and adhesion of the muscle does not get close to one another and the muscle does not substantially shorten.

During isotonic muscle activity the muscle is active, the origin and adhesion of the muscle shifts. Muscle activity is concentric isotonic when the origin and adhesion of an active muscle get closer to each other during the movement. We speak about excentric isotonic muscle activity when the muscle origin and adhesion get further away from each other while the muscle is active, so the muscle stretches in a controlled way against the gravitational force.

The joint occurrence of the excentric and concentric muscle activity during complex movements is the econcentric muscle activity.

The applied forms of movements in medical gymnastics are the passive moving of the patient, i.e. passive motion, guided active exercises and active exercises. During passive motion we position the patient in a lying or sitting position. The patient's movements are carried out by an external force. The primary purpose of passive motion is to retain the joints' range of motion (ROM refers to range of motion) and the prevention of contracture. If passive motion is performed rapidly, it has a circulation increasing effect, if it is done at a slow pace, it dissolves spasms. The patient tries to carry out the exercise together with the therapist when he experiences his being passively moved in thought. During the motion muscle tremor is experienced. This group of exercises has a muscle-strengthening effect in case of weak muscles. During passive motion extra attention must be paid to the protection of the therapist's spine (as given in detail in the chapter on patients' motion).

Passive motion can be done manually or with a passive motioning machine (CPM refers to continuous passive motion, Figure 6), or with different suspension constructions (Figures 7a and 7b). Passive motion can take place in subaqual space, where using the ascension force of the water, the therapist can perform the patient's motion in an exonerated position. As means of aiding the patient's exoneration, water wall bars, limb rings similar to rubber life belts, aquatherapeutical devices e.g. swimbelts, boots, foam dumbbells, kickrollers, swimbuoys, floating boards can be used.

During guided active gymnastics or supported movements, patients cannot overcome the force of gravity with

their own muscular strength, but by "switching off", the force of gravity they can actively implement motion performed perpendicularly to the gravitational force field. The motion can be aided with a practice board, with different suspensions and by the ascension force of the water. Guided active gymnastics can be used for muscle strengthening in case of patients with muscle-strength degree two, and for the mobilization of joints for patients with muscle-strength degree three.

Active gymnastic exercises are used when patients do the exercises with their own muscle power, without outside help, upon verbal instructions.

During isometric exercises, muscle tension and muscle activity are observed but there is no movement created in the joints. Isometric exercises can be used in case of patients with muscle-strength degree one. Isometric exercises can be applied if the movement of the joints is painful, joint ROM is limited, or joint motion is contraindicated, but we want to maintain the flexibility and strength of the muscles.

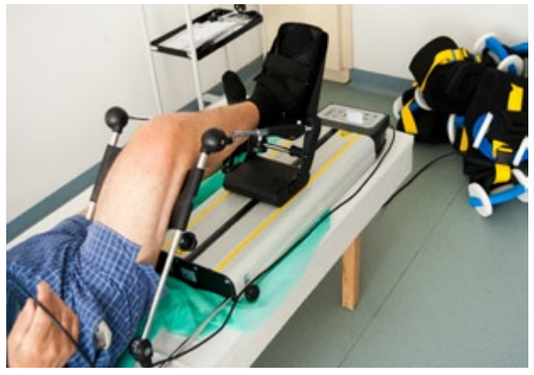

Figure 6: CPM treatment

Figure 7: Treatment with different suspension methods

Innervational exercises are applicable during plaster fixation to avoid muscular atrophy and to maintain the ability for muscle functions.

In the course of exercises against the gravitational force, the weight of the limb is moved parallel with the power line of the gravitational force but in the opposite direction. This form of movement is used for muscle strengtening in case of mucle-strength degree three and for mobilization in case of muscle-strength degree four or five.

Resistance workout means exercises performed against resistance. Resistance may be the therapist's hands as manual resistance or water resistancy by using surface enhancing devices. During a resistance workout strengthening rubber bands can be used, the advantage of which is that resistance gradually increases by the stretch of the bands, so they are less dangerous than the use of free weights, that is why it serves the purpose to start a resistance workout with strengthening rubber bands. The traditional free weights are the weight cuffs which can be placed on the ankles or wrists, the anatomical dumbbells, barbells, weight balls. For strengthening the upper limbs handtrainers, grip rings, elastic rubber bars, hand-strengthening sieve, therapeutic playdough can be used. An instrumental gym workout is an integral part of the resistance workout that can also be used in prevention and rehabilitation. Strength improving devices of the sort have been developed which properly serve the the goals of rehabilitation, in addition to the purposes of sports and fitness, since they have different types and more precise adjustment options, and technologies to protect the joints are applied, for example with the SFR and David system.

The special techniques and methods applied in medical gymnastics are as follows:

Halliwick

The Halliwick method was created by McMillian, it is based on aqua therapy and swimming instruction. It is primarily applied in neurology and orthopedics. The purpose of the therapy is muscle strengthening, mobilization, ROM increase, relieving pain, dissolving spasms, improve head and trunk control, developing the sense of equilibrium and stamina.

Bad Ragaz

Bad Ragaz Ring Method (BRRM), in which the patient moves in the water in three dimensions, according to PNF movement patterns, while he is being supported with limb rings. The aim of the therapy is muscle strengthening and re-learning movements, enhancing ROM, muscle tone reduction, relaxation, and the stabilization of the trunk.

Watsu

The name Watsu is derived from the word "water" and "Shiatsu" (Japanese massage). It involves movements, motion done in water, which includes massage, joint mobilization, stretching and Japanese massage. As a result of it physiological tone may develop and depression decreases. International surveys showed its beneficial effects with hemiparetic patients.

Treadmill training

Treadmill training is teaching walking on a treadmill and practising walking by partial loading of the body weight. The partial loading is achieved by the suspension of the patient and this way only part of the patient's body weight gets to the lower limbs. Practising the phases of walking may be aided by one or two therapists. The disadvantage of the method is that the movements on the treadmill are not completely identical with normal walking.

Aquatreadmill

Aquatreadmill is "treadmill" applied in subaqual space, the patient does the walking on several rotatable rods. During movements the physical properties of water (drag, buoyancy, hydrostatic pressure) are effective.

Bobath method

The Bobath method is a complex psychomotoric developmental method built on neurophysiological bases, it involves a problem-solving approach for the examination and treatment of hemiplegic patients. The treatment is aimed at optimizing the function, reaching the maximum function, the improvement of postural control and developing selective movements by facilitation and inhibition. Its scope of exercises include head, trunk and limb control exercises, placing, holding, soft parts mobilization, breathing and speech improvement, special muscle strengthening with unilateral exercises.

Neuro-Developmental Treatment (NDT)

NDT is based on the theoretical background of the Bobath method, and aims to achieve optimal function and to develop optimal quality of motion. The treatment is based on the dynamic pattern theory. The treatments include facilitational techniques (sweep tapping, pressure tapping, alternate tapping, inhibition tapping), inhibitory techniques (pressure on muscle origins, rapid alternating movements, axial rotation, special vibration), supplementary treatments (changing the environment, practising movements, specific stimulations e.g. with ice, rubbing) and relaxation.

Vojta method

The Vojta method was developed by Václav Vojta, a Czech neurosurgeon professor. The method is based on reflexlocomotion, movements are evoked by the stimulation of starter zones. The purpose of the therapy is to develop inborn physiological motion patterns, postural reactivity, teaching erect postural mechanisms, their reeducation, to achieve a maximum range of motion, facial and mouth cavity motion development, the activation of eye movements, improving the functions of the bladder, rectum and other internal organs and chewing, swallowing and speech development.

Schroth method

The Schroth method is the therapy for idiopathic scoliosis. It treats the scoliosis multifactorial disorder (accompanying rotation at fixed lateral bend, dysfunction of the sagittal curves, segmental anteflexion) with a special three-dimensional scope of movements which are based on the deneutralization, lateralisation and rotation of the head, shoulder girdle and the pelvis. During the therapy muscle strengthening, stabilizing exercises are done in a corrected position.

Williams therapy

Williams therapy is the treatment for the non-specific low back pain syndrome (LBP) with active and passive trunk flexional exercises. It has an analgesic effect.

McKenzie method

The McKenzie method is a specialized examination and treatment method for spine problems, developed by Robert McKenzie. Based on the publications it is said to have a pain-relieving effect in the acute and subacute phase, it bears long-term efficiency when supplemented with muscle strengthening exercises. The advantage of the method is that the exercises can be acquired quickly and safely and can be independently conducted.

Active lumbar stabilization

Active lumbar stabilization is a static and dynamic muscle training in the area of m. multifidus, m. erector spinae, and the abdominal muscles. In the course of the therapy primarily muscle strengthening, strength and stamina building exercises are done which are supplemented by ROM, balance and coordination exercises.

Back School

Back School programmes are aimed at the prevention of spinal disorders of all ages (preschool, school, adult) according to daily activities.

KinesioTape

The KinesioTape is a special adhesive tape with similar properties to those of the skin. As a result of the treatment microcirculation improves, the muscle tone may change, the endogenous analgesic system is activated, the stabilization of joints can be achieved. Regarding the Kinesio Tape application methods muscle, ligament, fascia, correcture, lymph, tendon and functional techniques can be distinguished.

Dévény method

The Dévény method is the complex method of movement rehabilitation by Anna Dévény, physiotherapist and professional artistic gymnastics trainer. Both the muscles and the nervous system regulation are effected by the special grip system of this method. According to its basic principle, the central nervous system can be directly stimulated by the stimulation of the end organs which can be found in the tendons.

The scope of exercises are: (1) SMT - special manual techniques, muscle-tendon-fascia treatment and (2) applied gymnastics, the approach, methods and exercises of artistic gymnastics are used for remedial purposes.

Boulder therapy

Boulder therapy is a climbing therapy (Figure 12), upon the application of which climbing is performed on an artifi-

cial wall (climbing wall) at a low height, without a safety rope. As a result of Boulder therapy the maximal strength, strength stamina, flexibility, ROM, balance and coordination increase, body posture is improved. The Boulder therapy is primarily used in Germany and Austria.

Katona's method

Katona's method is a neurohabilitational training, an extrapyramidal neuro therapy developed by Ferenc Katona M.D. and his team. According to its basic principle, physical therapy activates the automatic motion regulation of an infant's brain. It includes special patients' examinational methods and a collection of therapeutic exercises, which should be applied several times a day.

Brunkow therapy

Brunkow therapy consists of isometric supporting-straining exercises, which are aimed at developing muscle balance. It is used in the field of neurology, orthopaedics and gynecology.

Proprioceptive Neuromuscular Facilitation (PNF)

Proprioceptive Neuromuscular Facilitation (PNF) was introduced by Kabat, Knott and Voss. Its theoretical background is: the various stimuli that induce the desired motion are the spatial and temporal summation, which helps, "facilitates" and makes motion easier, as well as irradiation, reciprocal innervation and successive induction. The special feature of the given exercises is that the patient does the movements on a spiral, diagonal path on the basis of the therapist's verbal guidance and against his manual resistance. With PNF movement patterns the position changing movements of sitting up or standing up from a lying position can also be done.

Proprioceptive training

Proprioceptive training is an exercise program carried out on an unstable support surface in order to develop neuromuscular reaction preparedness, neurophysiological stabilization and mobilization capacity, the stimulation of mechanoreceptors, the sensitivity of peripheral receptors and the processing and response ability of the central nervous system. The devices used for this therapy are: dyn air dynamic sitting cushion, aerostep, tilting board, balancing bench, balance trainer.

Cardio training

Cardio training is cardiorespiratory stamina development based on pulse control. The patient does continuous or interval-type training work in the target-pulse range for a predetermined period of time.

Magnus therapy

Magnus therapy is the isometric training of the trunk muscles and gluteal muscles. Its aim is to increase the strength involved in stabilizing the trunk, which is also applicable in case of bed-ridden patients.

Manual therapy

Manual therapy examines joint play and joint blocks with manual examination (the examination methods are: case history, inspection, palpation, joint blocks) and it is searching for pathological causes. The restoration of joint play is performed by joint mobilization, manipulation and soft tissue technique.

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Abbreviations

AAMI	Association for the Advancement of Medical Instrumentation
ABPM	Ambulatory Blood Pressure Measurement
ACM	Association for Computing Machinery
ADH	antidiuretikus hormon
AF	atrium fibrillatio
AIDS	acquired immunodeficiency syndrome;
AKH	Allgemeines Krankenhaus
ALAT	alanin-aminotransferase
ANA	American Nurses Association;
AOK	Allgemeine Ortskrankenkassen
AP	aspirin, clopidogrel
APACHE	Acute Physiology and Chronic Health Evaluation
AP-DRG	all patient DRG
ATC	the system of classification if medicinal products according to anatomical, therapeutic and chemical actions
ATP	adenozin-trifoszfát
AV	atrioventricularis
AWBZ, ZFW	forms of Dutch health insurance
BDZN	benzodiazepin
BK	bradikinin
BKK	Betriebskrankenkassen
BMI	Body Mass Index
BMJ	British Medical Journal
BRRM	Bad Ragaz ring method
BSc	Bachelor of Science
CA	cost analysis
CABI	Centre of Agriculture and Biosciences International
CAS	Coloured Analogue Scale
CBA	cost-benefit analysis
CDC	Center for Disease Control and Prevention
CEA	carcinoembryonalis antigen
CEA	cost-effectiveness analysis
CEN	Commission European de Normalization
CLA	conjugated linoleic acid
CMA	cost-minimization analysis
CNS	clinical nurse specialist
COX	ciklooxigenase
CPM	continuous passive motion
CRBSI	intravascular catether-related bloodstream infection
CRP	C-reaktív protein
CRT	controlled randomized trial
CSF	Cerebrospinal fluid
CT	computer tomography
CUA	cost-utility analysis
CVC	Central Venous Catheter
DALY	Disability Adjusted Life Years
DEM	German mark
DHA	District Health Authority (Great Britain)
DNR	do-not-resuscitate
DOAJ	Directory of Open Access Journals
^{1}DRG	diagnosis related group
^{2}DRG	dorsal root ganglion
EDTA	ethylenediaminetetraacetic acid
EBM; BAO	evidence based medicine
ECG	Electocardiography
EEG	electroencephalography, electroencephalogramm;
EKG	electrocardiography, electrocardiogram
EMG	electromyography, electromyogramm
EOG	electrooculography, electrooculogramm
EOL	end of life
EPO	Exclusive Provider Organization (USA)
ERCP	Endoscopic retrograde cholangiopancreatography
ERIC	Educational Resource Information Center
ESC	European Society of Cardiology
ESH	European Society of Hypertension
EST	Endoscopic sphincterotomy
EU	European Union
F	Foot
FAS	Facial Analogue Scale
FDA	Food and Drug Administration
FET	Forced expiration technique
FEV	Forced Expiratory Volume
FHSA	family health service authority (Great Britain)
FLACC	Face, Legs, Activity, Cry, Consolability
FNA	fine needle aspiration
FoNo	Formulae Normales
FSTA	Food Science and Technology Abstracts
FU	Fever of Unknown Origin
G	Gauge
γGT	γ-glutamil transpherase
GDP	gross domestic product
GH	growth hormone

GIB	Graphical Interactive Book
GP	General Practitioner (Great Britain)
Hb	hemoglobin
HbsAg	hepatitis B felületi (surface) antigén
HBV	hepatitis B virus
HCV	hepatitis C virus
HMO	Health Maintenance Organization (USA)
5-HT	5-hidroxiteriptamin, szerotonin
htx	hydrothorax
IAC	International Continence Society
IASP	International Association for the Study of the Pain
ic., IC	intracutan
ICN	International Council of Nurses
id., ID	intradermalis
ID	Intrinsicoid deflection
IEC	International Electrotechnical Commission
IFIS	International Food Information Service
IKK	Innungskrankenkassen
im., IM	intramuscularis
IPA	Independent Praxis Association (USA)
ISI	Institute for Scientific Information
ISO	International Organization of Standardization
IU, NE	international unit
JCR	Journal Citation Reports
L	Left
LAH/ LAFB	Left anterior hemiblock / left anterior fascicular block
LAM	Lege Artis Medicinae
LANSS	Leeds Assessment of Neuropathic Symptoms and Signs Pain Scale
LBBB	left bundle branch block
LBP	low back pain syndrom
LISTA	Library, Information Science & Technology Abstracts
LMWH	low molecular weight heparin
LPH/ LPFB	Left posterior hemiblock / left posterior fascicular block
LRC	Literature Resource Center
LTP	long-term potentiation
MeSH	Medical Subject Headings
MLA	Modern Language Association
MMWR	Morbidity & Mortality Weekly Report
MOP	μ-opioidreceptor
MS	multiple sclerosis
MR, MRI	magnetic resonance imaging;
MRSA	methicillin-resistant Staphylococcus aureus
MSc	Master of Science
N	Neutral
NAIT	neonatalis alloimmun thrombocytopenia
NCCLS	National Committee for Clinical and Laboratory Standards
NDT	Neuro-Developmental Treatment
NGF	nerve growth factor
NHS	National Health Service (Great Britain, United Kingdom)
NICE	National Institute for Clinical Excellence (Great Britain)
NP	nurse practitioner
NRS	Numerical Rating Scales
NSAID	non-steroid anti-inflammatory drug
OECD	Organization for Economic Co-operation and Development
OEP	Hungarian National Health Insurance Funds
OKI	Hungarian Royal Public Health Institute
OPAC	Online Public Access Cataloge
PAG	periaqueductalis
PCA	Patient Controlled Analgesia
PC-EDA	Patient Controlled Epidural Analgesia
PCG	primary care group (Great Britain)
PCT	primary care trust (Great Britain)
PEG	percutan endoscopos gastrostoma
PEJ	percutan endocopos jejunostoma
PEM	protein-energia malnutritio
^{2}PF	pectoral fremitus
PhD	Philosophiae Doctor
PICC	Peripherally Inserted Central Catheter
PKV	Verband der privaten Krankenversicherung
PMC	Patient Management Category
PND	paroxysmalis nocturnalis dyspnoe
PNF	Proprioceptív Neuromuscularis facilitation
p. o.	per os, peroralis
POMR	Problem Orientaed Medical Record
POS	Point-of-service
PPO	Preferred Provider Organization (USA)
PPS	prospective payment system
P.R.N.	pro re nata
PSC	primary sclerosing cholangitis
PT	physical therapy, physiotherapy
ptx	pneumothorax
PVC	polyvinyl chloride; polivinilklorid
QALY	Quality Adjusted Life Years
R	Right
RA	rheumatoid arthritis
RACP	risk adjusted capitation payment
RBBB	right bundle branch block
RCT	randomized controlled trials
REM	rapid eye movement
RFS	Rhoten Fatigue Scale
Rh	Rhesus

ROM	range of motion
sc., SC, SQ	subcutan
SCI	Science Citation Index
SD	Standard Deviation
SE	Standard Error
SGLT	sodium-glucose transporter
SHOT	SeriousHazards of Transfusion
SM	sclerosis multiplex
SMT	special manual techniques
SOB	shortness of breath; dyspnoe
SPA	spondylarthrosis ankylopoetica
sp gr	specific gravity
SSPA	soapsuds enema
SSRI	selective serotonine-reuptake inhibitor
TCAD	triciklikus antidepresszáns
TCI	„target controll" infusion
TDDS	transdermal drug delivery system
TENS	transcutan electric nerve stimulation
TOS	thoracic outlet szindróma
TPPs	total purchasing pilot sites (Great Britain)
TPN	total parenteral nutrition
TTS	transdermal therapeutic system
Ubg	urobilinogén
UK	United Kingdom
UN	United Nations
USA	United States of America
UV	ultraviolet
VCB	Vacuum core biopsy
VDS	Verbal Description Scale
VIMA	volatile induction and maintenance of anaesthesia
VKA	coumarin, warfarin
VLPP	Valsalva Leak Point Pressure
VT	yentricularis tachycardia
WBC	white blood cell
WHO	World Health Organization
WoS	Web of Science
WTZ	Dutch private insurance
ZVO	Dutch publicsservants' insurance

The following questions help you to check your knowledge: http://tamop.etk.pte.hu/testbook/

You can find the animated cartoons, the videos and the sound files under the following links:
animations cartoons: http://tamop.etk.pte.hu/apolastan/animaciok/english/index.html
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