BASICS OF CLINICAL PRACTICE I

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Basics of clinical practice 1

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BLOOD PRESSURE MEASUREMENT

The pressure exerted by blood on the walls of a blood vessel is one of the basic parameters for assessing the state of the cardiovascular (circulatory) and other systems of our body.

In addition to indicating the possible circulation problems, blood pressure levels and how they vary in relation to external stimuli (excitement, stress, training, time of day or night, season, other physiological or pathological conditions) help establish the diagnosis and determine the appropriate therapy.

Even healthy persons are recommended to have their blood pressure checked periodically, especially if their body weight fluctuates to a greater extent or if they have some of the risk factors for chronic diseases (smoking, increased blood fats, diabetes, obesity and physical inactivity).

Hypertension is blood pressure that is higher than normal. It is often referred to as the "silent killer".

This comes as no coincident, as there are many studies that confirm a positive correlation between elevated arterial pressure and faster development of atherosclerosis (atherosclerosis is a degenerative process in the wall of blood vessels that leads to the formation of plaques that can cause arteries to narrow, blocking blood flow), damage to the heart muscle that weakens its ability to pump blood (the so-called hypertensive cardiomyopathy), changes in the structure of kidney tissue and arterioles in important organs (eye, ear, central nervous system), etc.

In addition to the above, hypertension is the most common non-communicable chronic disease among the adult population (it affects 20 to 30% of the total world population), which exists all over the world, equally affecting both sexes, and as to women, they are affected especially after menopause due to the loss of the protective effect of estrogen.

How to measure pressure?

Blood pressure is measured using manual mercury sphygmomanometer (millimeter of mercury - mmHg) or a mechanical manometer (image 1) with values expressed in kPa. Typically, blood pressure is taken in both arms - the cuff is fitted on the upper arm (in standard mechanical and mercury devices), i.e. on the forearm (electronic monitors), whereafter airflow valve is closed and the cuff is inflated, thus creating pressure that is transmitted through the skin to all tissues under the cuff, including the artery. When the external pressure overcomes the pressure of the blood flow in the artery, the blood stops flowing and there is no pulse. After that, the airflow valve is gently opened, and the sounds are recorded with the head of the stethoscope placed in the cubital fossa. The first sound that we hear is the value of the cuff pressure that stops blood flow and it is called the systolic blood pressure or the "top value". By gradually releasing the air from the cuff, the pressure in the cuff falls, blood flow is re-established until the blood vessel volume

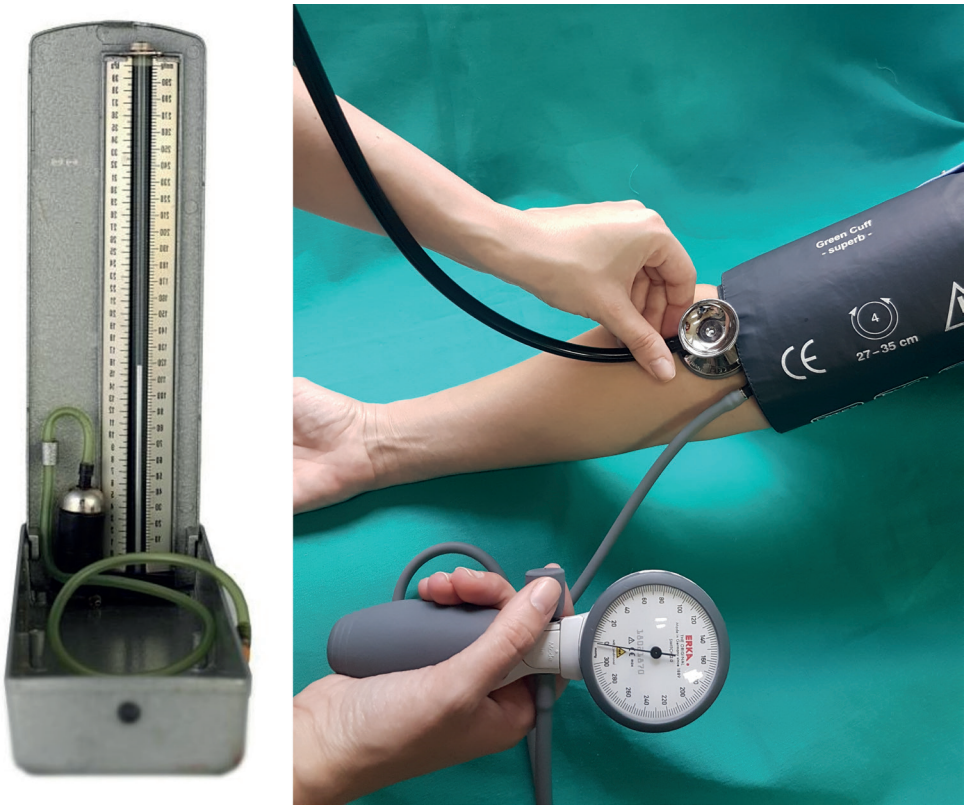

Image 1. Mercury manometer and pressure measurement using a mechanical manometer

returns to normal values, i.e. when the vessel pressure finally overcomes the residual cuff pressure, whereas the last sound is called the diastolic blood pressure (the "lower value"). The blood flows in a vortex, producing characteristic sound effects - sound at each heartbeat (the so-called Korotkoff sounds).

When the pressure in the cuff, the value of which is read on the meter or mercury column, falls below the diastolic pressure value, these sounds can no longer be heard. Devices based on a mercury column are, in general, the most accurate ones, followed by mechanical manometer, and electronic monitors.

The normal levels are 120/80 mmHg (30-year-old man). The systolic blood pressure (SBP) values of above 140 mmHg, i.e. diastolic blood pressure (DBP) values of above 90 mmHg are considered pathological. This parameter is measured for each hospitalized patient at least once a day.

HEART RATE MEASUREMENT

Arterial pulse, the pulse wave, is a rhythmic oscillation in the arterial wall due to increased pressure inside the arteries during the systole, i.e., the contraction of the heart muscle of the chambers and atria. When the heart pushes blood through the aorta during systole, there is an increase in pressure in the arterial system. The kinetic energy of blood movement is converted into potential energy that stretches the walls of the aorta. During diastole, the stretched walls of the aorta return to their original position, and the potential energy of the stretched walls is converted into the kinetic energy of blood movement, which enables blood flow through the arteries during diastole. The ejection of blood during diastole reduces the pressure in the aorta. A new blood ejection follows with a new heart contraction and constantly repeats at certain intervals. This enables continuous influx of blood into tissues and organs.

The pulsatile wall oscillation, which begins in the proximal aorta, extends peripherally towards the arterioles. The pulse pressure that occurs in the arteries during the cardiac cycle runs faster than blood because blood is an incompressible fluid, and blood vessels are elastic. Arterioles provide the resistance that "dampens" the pulse, for it to completely disappear at the capillary level.

The pulse is the number of heart beats per minute. In most healthy adults, resting heart rate ranges between 60 and 80 per minute. During sleep, it can drop to 40 beats per minute, and it increases during periods of activity. In newborns and children, the number of heartbeats is higher. Fear, various medications, stress, consumption of coffee and alcohol, smoking, etc., also influence pulse oscillations in arteries.

Examination of arterial pulse by palpation provides information about the functioning of the cardiovascular system. These examinations allow:

- assessment of the presence or absence of heart activity (cardiac arrest)
- determining the frequency of heart contractions
- heartbeat characteristics (rhythmic or arrhythmic heartbeat)
- the presence of peripheral artery narrowing or blockage (for example, by detecting differences in pulse between extremities) etc.

Examination of arterial pulse by palpation can be performed on different arteries. The examiner presses their fingers on specific points on the patient's body. These points are those below which there is a firm (bony) surface or points on large arteries where the oscillations are stronger.

Having different impressions as to the quality of the pulse on the examined part of the body is best achieved using the fingertips (which are most sensitive to touch). The pulse is palpated bilaterally and is always symmetric.

The pulsation of arteries in the arterial pulse can be easily detected by palpation above superficial arteries at the following points on the body:

Image 2. Measuring pulse in *a.radialis*

- Above the radial artery of the forearm *(a. radialis)* (image 2)
- Around the temples, above the temporal artery *(a. temporalis)*
- On the neck, in the area of the carotid artery *(a. carotis communis)*
- In the area of the axillary artery *(a. axillaris)*
- In the area of the brachial artery *(a. brachialis)*
- In the area of the femoral artery *(a. femoralis)*
- In the area of the popliteal artery *(a. poplitea)*
- In the area behind the inner side of the ankle joint *(a.tibialis posterior)*
- On the foot in the area of the dorsal pedis artery *(a. dorsalis pedis)*

It is most commonly measured in the *sulcus pulsus* above the *a.radialis* in the area of the wrist joint. It is measured by placing the index, middle, and ring fingers over the artery and counting the beats per minute using a stopwatch. This parameter needs to be determined in practically every patient examination. In other locations, it is measured to assess circulation in the extremities, whereas in patients in shock, it is measured on the neck. In these places, the number of beats is usually not recorded, but rather the presence or absence of the pulse, as a sign of the limb vitality or circulatory compromise.

BODY TEMPERATURE MEASUREMENT

Body temperature is a reflection of the body making heat to stay warm or reducing heat to cool off. The center of thermoregulation is located in the hypothalamus and regulates body temperature. Due to the coordination of multiple organs and systems – blood, skin, organs of secretion and respiration, body temperature is maintained within normal values from 36° to 37°C. All values above 37°C indicate *hyperthermia*, whereas those below 36°C indicate *hypothermia* (subfebrile temperatures range from 37,1 to 37,7; febrile temperatures range from 37,8 to 39;

Image 3. Digital thermometer

high fever is from 39,1 to 40,9, and temperature greater than is called hyperpyrexia 41°C). Changes in body temperature can be physiological and pathological. Physiological changes are transient and within the aforementioned limits, caused by food and fluid intake, physical and mental activities, work-rest balance, clothing, hormonal activities (especially in women), or external factors (temperature, humidity, wind). A pathological increase in temperature is a result chemical factors have on the thermoregulatory center. It is likely due to bacterial toxins or products of protein breakdown in the body. After such stimuli, the thermoregulatory center increases the chemical reaction that results in an increase in body temperature.

Body temperature is most commonly measured with mercury thermometer, while digital thermometers (image 3) are increasingly used, especially for body cavity temperature measurement. The degree Celsius is the unit of temperature on the Celsius scale.

Body temperature is most commonly measured *axillary*, in the armpit, but it can also be measured in other skin folds – *inguinal* or *popliteal region*. In children, axillary temperature measurement is considered unreliable. If body cavity temperature is measured – *orally* (sublingually) or *rectally* (recommended for younger children), the obtained values shall be 0,5° - 1° C higher. Taking rectal temperature

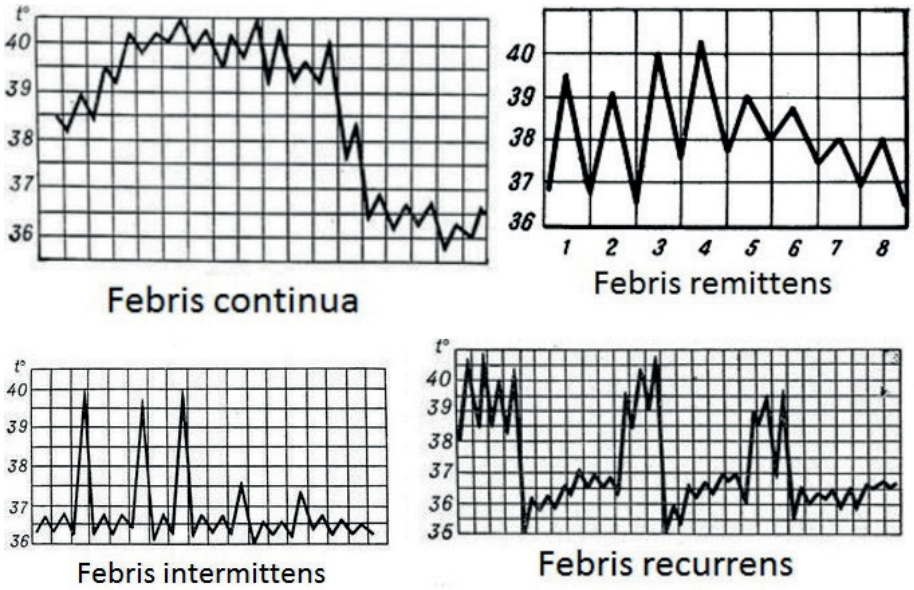

Image 4. Different temperature curves

is used in pediatrics and in cases where it is necessary to determine the difference between rectally and axillary measured temperatures. Taking oral temperature is less commonly used and is prohibited in children and unconscious patients. Upon admission to ward, body temperature is measured at least twice daily, and more frequently if needed, in order to monitor its course, especially if there are condition-related changes that cause temperature rise. The obtained values are recorded in temperature chart, whereas the points are connected giving a characteristic appearance for certain types of fever (temperature curve). There are different temperature curves: febris continua, remittens, interemittens (image 4).

Certain diseases have different temperature curves, so temperature curves have diagnostic value.

Febris continua is a fever with daily fluctuations do not exceed 1 °C. The temperature rise is abrupt, maintaining a continuous pattern, typically indicating high fever that lasts for days or weeks. It occurs in pneumonia and typhoid fever.

Febris remittens is a fever with daily fluctuations exceed 1 °C, with the minimum temperature always above 37° C. It occurs in suppurative infections, pneumonia, pulmonary tuberculosis, and typhoid fever.

Febris interemittens is a fever with daily fluctuations from 1 to 2 °C, but the minimum temperature is always below 37° C (apirrhexions). This fever type is observed in the malaria, and the upper value is very high in septic conditions, the temperature curve is called septic temperature. It is characterized by the rising periods of temperature that alternate with the periods of normal temperature within 24 h. It occurs in severe forms of tuberculosis and sepsis.

Febris recurrens is a fever characterized by periods of rising temperature (in days) and normal level of temperature. The temperature rise is usually abrupt. It occurs in malaria, recurrent typhus, or in hidden suppurative foci.

Feveris the most common symptom of illness, but is not specific. High fever manifests as a feeling of warmth or coldness, sometimes sweating. Objectively, the following is observed in patients: flushed face, rapid breathing, warm skin, and an increased heart rate.

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RESPIRATORY RATE MEASUREMENT

Breathing (*respiratio*) is the exchange of gases between the organism and the external environment, which occurs in the lungs. Respiration consists of: inhalation (*inspirium*), exhalation (*expirium*), and a pause (*apnea*). Inspiration is an active process of taking in oxygen from inhaled air, while expiration, which is a passive process, releases carbon dioxide with exhaled air. For normal breathing, the airways need to be unobstructed, the lungs healthy, and the chest wall intact. The

breathing function is regulated by the respiratory center located in the medulla oblongata. The normal respiratory rate is 18-20 breaths per minute in adults and 20-22 breaths per minute in children. Breathing can be thoracic (in women) and abdominal (in men). Breathing rate can be normal (*eupnea*), rapid (*tachypnea*), slow (*bradipnea*). It is determined by counting breaths per unit of time, while observing the patient. This is done in intensive care units, pulmonology departments, and when needed. At present, taking gas analyses is a more reliable diagnostic tool, which shows whether the patient is in respiratory acidosis or alkalosis.

HEIGHT AND WEIGHT MEASUREMENT

Body height is expressed in centimeters (cm) and determined by having the patient stand with feet flat against an appropriate measuring instrument or mark on the wall. The heels, buttocks, and back of the head should be flat against the surface. It is measured three times, and the average value is recorded.

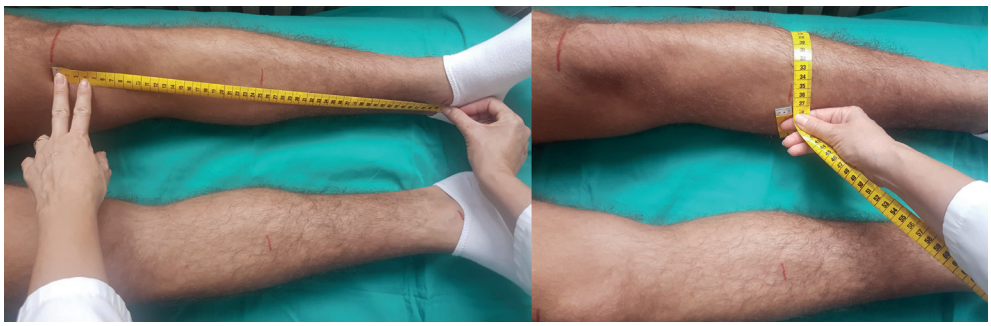
This parameter is necessary in pediatric practice, in wellness exams, and in the adult endocrinology departments.

Body weight is expressed in kilograms (kg) and the patient is measured on a scale wearing underwear.

This parameter is necessary in pediatrics, routine check-ups, endocrinology, dietetic and hygiene units, and the data is often needed for the purpose of adjusting medication dosage in anesthesiology and internal medicine.

LIMB CIRCUMFERENCE MEASUREMENT

Measurement of circumference is performed on the upper and lower extremities, proximally and distally, but always on both sides of the body. Measurement is done with a tape measure and expressed in centimeters. In order to take more precise measurements, level of measurement is determined in relation to reference points, such as the upper pole of the patella, etc. It is most commonly used in vascular surgery, in cases of suspected deep vein thrombosis (image 5).



Slika 5. Merenje obima ekstremiteta

DRUG ADMINISTRATION METHODS

The method of administration depends on whether a **local** or **systemic** effect is expected from the drug. In order to achieve a local effect, drugs are applied to the skin or easily accessible mucous membranes, while systemic drug application occurs via the gastrointestinal tract, respiratory tract, or direct injection into specific tissues.

1.Local administration of drugs

2. Systemic administration of drugs

a) Administration of drugs through the gastrointestinal tract or enteral administration
- Oral administration of drugs
- Peroral administration of drugs
- Rectal administration of drugs

b) Administration of drugs through the respiratory tract

c) Administration of drugs by injection
- Intravenous
- Intramuscular
- Subcutaneous

d) Other injection methods

1. Local administration of drugs

In the treatment of skin and mucous membrane diseases, the drug is most commonly applied directly to the affected area. Most drugs do not pass through intact skin, so their application is expected to have a local effect. Examples of this administration method include ointments, lotions, and creams (image 6). Hydrosoluble drugs are not absorbed the application site at all from, while liposoluble substances may be absorbed. Applying a plastic occlusive dressing over medicinal creams significantly increases their absorption. Systemic drug action can be achieved by applying the so-called **medicated patches** to the skin. An example of such drug application is the application of glyceryl trinitrate to the skin of the chest in angina pectoris. Drugs generally penetrate mucous membranes better than intact skin. Other examples include administering drugs into the conjunctival sac of the eye (ointment, drops) or via the vaginal mucosa (vaginal tablets).

Image 6. Drugs for local administration

2. Systemic administration of drugs

Systemic drug administration means that the drug acts after absorption into deeper tissues or the blood, whereafter it is distributed throughout the body. Introducing a drug into the body is divided into **enteral** and **parenteral** administration.

a) Administration of drugs through the gastrointestinal tract (enteral administration)

Drugs can be absorbed throughout the entire gastrointestinal tract. Depending on the route of administration, it can either be oral, peroral, or rectal drug administration

– **Oral administration of drugs**

The oral mucosa can absorb certain drugs, so they can be applied to the mucous membrane of the oral cavity (buccal) or sublingually, i.e., under the tongue. This method of drug administration facilitates rapid absorption. Additionally, by using this route of administration, the drug bypasses the liver, where it would be partially inactivated if swallowed. One of the many drugs used in this way is nitroglycerin, which, enters the bloodstream after absorption and is quickly transferred to the heart via the superior vena cava.

- **Peroral administration of drugs**

In peroral administration, drugs are ingested into the body. This method of drug administration is the simplest and cheapest, as it does not require any special equipment or patient preparation. It is also the most comfortable method, as it can be done by the patient or their caregiver.

The disadvantage of this method is the uneven absorption of the drug, often insufficient control of its regular intake (compliance), and reduced drug utilization, as the drug is transferred to the liver after absorption in the intestine, where much of the dose is reduced by xenobiotic metabolism. Types of drugs administered this way include tablets, capsules, coated tablets, drops, syrups, etc. (image 7).

Image 7. Drugs for peroral administration

- **Rectal administration of drugs**

Drugs are administered rectally when their oral administration is either difficult or impossible (e.g. persistent vomiting, unconsciousness). This method is also used if a drug is irritant to the stomach (e.g. chloral hydrate). Certain drugs can lead to damage to the gastrointestinal mucosa (e.g. diclofenac), whereas this method does not. This is often used to administer diazepam to babies who have generalized seizures accompanied by high fever. This way of delivering drug is called suppository.

b) Administration of drugs through the respiratory tract

Drugs administered through the respiratory tract usually require the use of specific devices. The simplest ones include inhalers or nebulizers. For inhalation anesthetics, systems are used to regulate not only the delivery of the drug but also the oxygen necessary for respiration

Image 8. Inhaler

c) Administration of drugs by injection

A drug administered through the gastrointestinal mucosa is partially inactivated in the liver, whereas this is avoided by injecting the drug, which results in an increased bioavailability (the portion of the drug that reaches the bloodstream). This method is used when a patient cannot receive the drug in any other way (difficulty swallowing, unconsciousness). Drugs for parenteral administration are available in the form of injections or, when used to replace fluids, in the form of infusions (image 9).

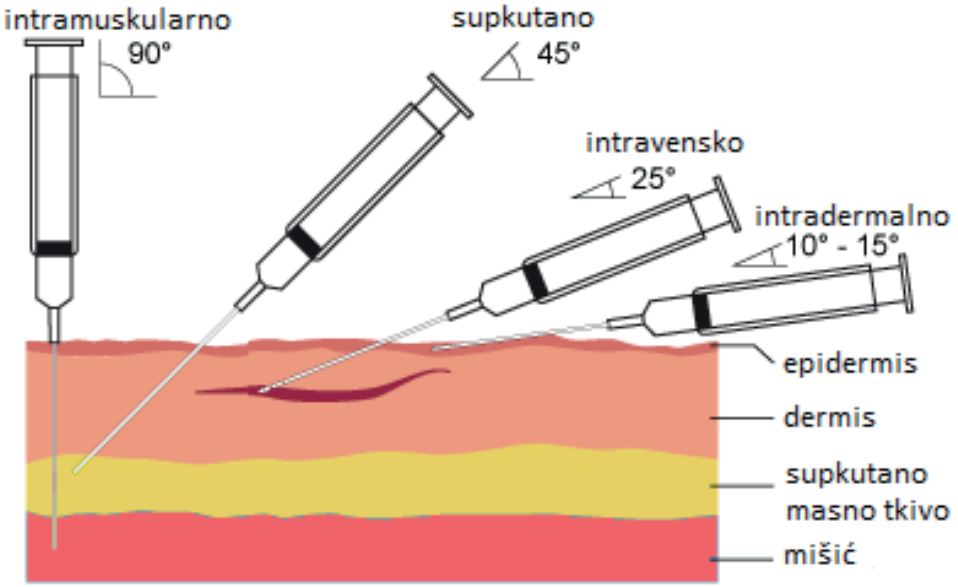


Image 9. Routes for parenteral medications

– **Intravenous**

Intravenous administration refers to the administration of drugs into a vein. After such administration, the drug will rapidly exert its effects. Intravenous administration is impossible if patient's blood pressure is very low or their blood vessels collapsed. It should be noted that only solutions, not **suspensions**, **oily solutions**, or emulsions, should be given intravenously, as it can lead to embolism. Nowadays,

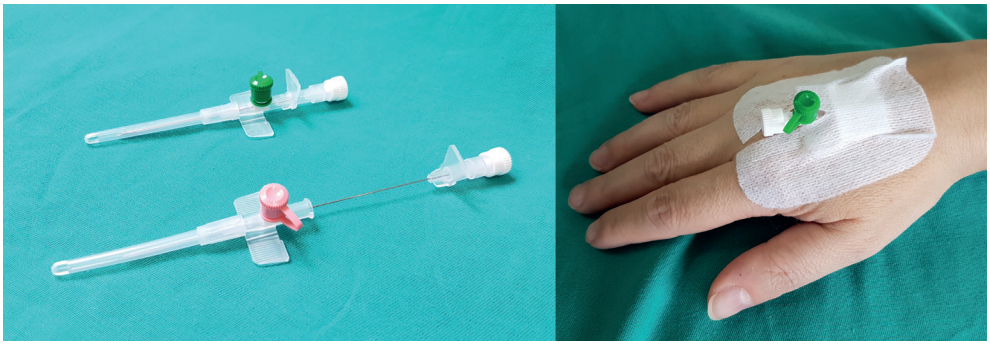


Image 10. Intravenous cannulas

these drugs are most commonly administered via intravenous catheters (known as "IV lines") (image 10).

– **Intramuscular**

Intramuscular (IM) injection is the most commonly used parenteral method of drug administration. Suspensions and emulsions can be injected this way. The drug exerts its effect relatively quickly. However, the procedure also has its drawbacks. Injecting larger volumes leads to tissue stretching, damage, and pain, so the maximum amount of drug that can be injected this way is 3-5 mL. Pain can occur when injecting acidic solutions or solutions that are not osmotically identical to interstitial fluid. Improper injection can lead to blood vessel injury, direct entry of the drug into the circulation or nerve injury. In the case of **suspensions** or **emulsions**, such an error in administration can lead to the dissemination of microemboli, and even to the death of the patient. It is most often administered to *m.gluteus maximusa* (gluteal region), specifically the upper outer quadrant, where there are the fewest blood vessels and where the sciatic nerve does not pass n.ischiadicus. It is given at a 90° angle. Another less common site of administration is *m.quadriceps femoris* (front of the thigh), where the injection is administered at a 45° angle.

– **Subcutaneous**

Subcutaneous administration of medications allows for the injection of insoluble substances. The injected volume needs to be small, as otherwise, there may be pain and tissue damage at the injection site. The rate of absorption is slower compared to intramuscular administration because muscle tissue is better perfused. This method is significant for the administration of controlled-release preparations, such as insulin and heparin. Injection sites include the outer area of the upper arm, the anterolateral aspect of the thigh, and the abdominal wall

– **Intracutaneous or cutaneous (intradermal) application**

This method is used to administer small amounts of medication for diagnostic and prophylactic purposes (vaccines, allergens for allergy testing, etc.). It is ad-

ministered in areas where the skin is softer and less hairy, such as the inner aspect of the forearm and the outer aspect of the upper arm. The medication is introduced into the middle layer of the skin in a small volume of 0.1 to 0.2 mL. A wheal shall appear at the site of administration.

d) Other injection methods

In some cases, it is necessary to achieve a rapid effect of the medication on the central nervous system, and in such cases, the medication is administered **intrathecally**, into the subarachnoid area. This procedure is useful for performing spinal anesthesia.

Administering medication into arteries is a more challenging procedure. Intra-arterial administration of medication is an effective way to achieve a local effect (distal to the site of administration).

Intraperitoneal drug administration is the administration of drug into the peritoneal cavity.

Less common routes of drug administration by injection include **submucosal** (under the mucous membrane), **intra-articular** (into a joint), and **intracardiac** (into the heart).

Image 11. Infusion system and infusion solution

Infusions are most commonly administered into veins, but they can also be administered into body cavities (e.g. intraperitoneally). The most commonly used solutions for infusion are saline (0.9% NaCl), Ringer's solution, and Hartmann's solution that contains lactate. They are administered using an infusion set (image 11).

What are injections?

Injection involves administering liquid medications using sterile equipment, such as syringes and needles (image 12). Before administering the injection, the nurse first disinfects the area of the skin where the injection is to be given. Injections should only be administered by qualified medical personnel, following the instructions and orders of a doctor.

Image 12. Medications for parenteral administration and sterile injection equipment

Some medications can be administered in multiple ways (e.g., IM or IV) or are available in various pharmaceutical forms (for oral or parenteral use). However, certain substances can only be given in a specific way (e.g. only intramuscularly because they can cause vascular occlusion, or only intravenously because they can cause tissue necrosis). Hospital therapy is administered according to the temperature and therapeutic chart, and it is mandatory to check the patient's name and surname, the drug form, dosage, and the method of application before administration.

INTRAVENOUS NUTRITION

Intravenous (parenteral) nutrition involves delivering nutrients directly into the circulation, bypassing the gastrointestinal system and the first pass through the liver. Intravenous nutrition is part of **life support therapies** used to sustain a patient's life when key body systems are not functioning adequately. This can be in the form of a feeding tube, intravenous infusion, or total parenteral nutrition.

Essentially, intravenous nutrition is artificial nutrition that serves as a necessary alternative in all conditions where natural feeding is either ineffective or contraindicated. Intravenous nutrition must be adequate to meet the basic requirements of optimal intake, with a balanced ratio of water, energy substances, proteins, vitamins, minerals, and trace elements.

Significance and types

In cases where patients are unable to take food orally or enterally, intravenous nutrition is a treatment method that enables a more successful and faster recovery, significantly shortening hospital stays, reducing treatment costs, and mortality rate. Malfunction of the digestive system and the inability to ingest food orally, along with its increased consumption, is a common consequence of major surgeries, injuries, and systemic infections. In these conditions, malnutrition occurs and disrupts the clinical course and outcome of the disease. Intravenous nutrition can be **partial** or **complete** (total), as well as **continuous** (24-hour) or **cyclic**.

It can be administered through a peripheral or central vein.

Abrupt discontinuation of intravenous nutrition can lead to hypoglycemia, especially in undernourished patients. For patients who are on cyclic intravenous feeding, the infusion rate should be halved one hour before discontinuation.

NASOGASTRIC TUBE

A nasogastric tube is a marked tube inserted into the stomach through the nose. The nasogastric tube is inserted through the more patent nostril. In case of head or nose injuries, the nasogastric tube is inserted through the mouth (orogastric). The external part of the tube is fixed to the nose with a plaster. The tube is equipped with an appropriate feeding port cap that should be closed between feedings. (image 13). Reasons for placing a nasogastric tube:

- Aspiration of gastric contents for diagnostic procedures;
- Gastrointestinal decompression (prevention of regurgitation and vomiting, and consequently aspiration of gastric contents);
- Drug administration;
- Gastric content removal (e.g., in cases of poisoning);
- Patient feeding.

Enteral nutrition has numerous advantages and fewer complications compared to parenteral nutrition: it is simple and does not require significant technical support, it does not cause frequent or serious complications, it is cheaper, and it allows for the intake of probiotics and dietary fiber.

Complications of enteral feeding may include digestive issues (diarrhea, vomiting).

Image 13. Nasogastric tube

Complications of nasogastric tube feeding, as a form of enteral nutrition, can also include:

1. Tissue injuries: nose, throat, esophagus;
2. Tube displacement, dislodgement;
   Food aspiration and pneumonia caused by food inhaled into the lungs.

DRAWING BLOOD

Blood is an important diagnostic material, the morphological, biochemical, immunological, and bacterial analysis of which can help establishing a diagnosis, and sometimes it is the main method of diagnosing certain diseases. Blood is usually taken for laboratory analysis in the morning, before eating, but it can also be taken at any time of the day if necessary. Sometimes, blood analysis is necessary to monitor the effectiveness of therapy and determine the levels of drugs in the plasma. For a complete blood count and blood sugar level analysis, blood is taken from the fingertip using a special lancet. For most other analyses, venous blood is drawn. Today, blood is drawn using a needle and vacutainer system, usually from the cubital veins, after applying a tourniquet proximally (image 14). The tubes have color-coded caps, and some contain pre-prepared reagents. For certain analyses, anticoagulants are used as reagents (sedimentation and prothrombin time).

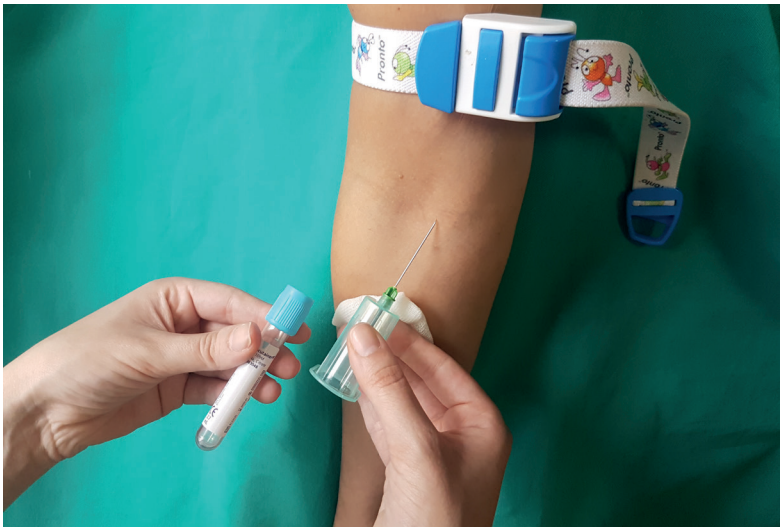
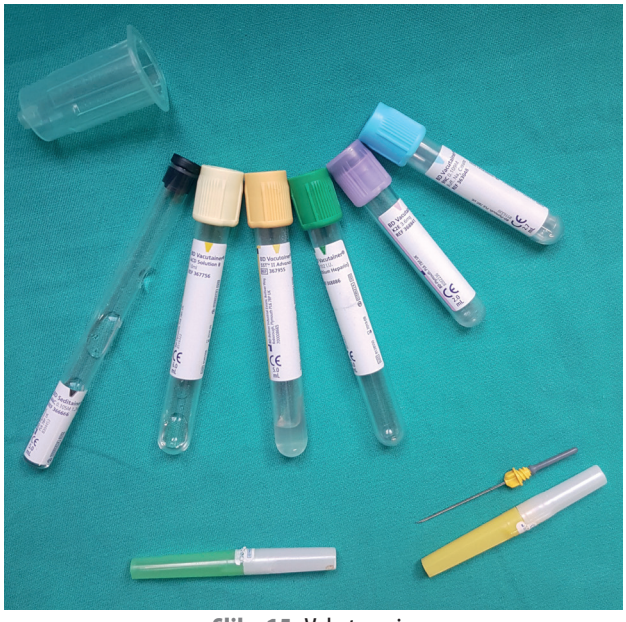


Image 14. Taking blood samples

Tubes for blood analysis ("vacutainers"):

1. Blue cap - coagulation (hemostasis);
2. Dark yellow cap - biochemistry;
3. Light yellow cap - blood type and Rh factor;
4. Black cap - sedimentation;
5. Lilac cap - blood count (image 15).



Slika 15. Vakutaneri

These tubes are processed in the laboratory using specially designed machines, and the result is issued digitally, with values that deviate from the normal range typically marked with "*". The last column usually contains the reference (normal) values for the given analysis. Blood from a vein can be drawn by doctors, medical nurse-technicians, and for determining gas analyses, this procedure is done by a doctor. Gas analyses show the saturation of blood with oxygen and carbon dioxide, as well as the presence of acidosis or alkalosis.

The most common blood tests are:

- Erythrocyte sedimentation rate (ESR) – represents the settling of blood elements at the bottom of a blood sample. Inflammation accelerates the settling of elements, thus increasing the sedimentation rate. Normal values for men in the first hour are 2-10, and for women, 4-20. Nowadays, determining C-reactive protein (CRP) is considered a more sensitive method for inflammation.
- Hemogram or complete blood count (red and white blood cells and blood platelets);
- Hepatogram, which includes liver function tests (transaminases, bilirubin);
- Urea and creatinine, as indicators of kidney function;
- Blood glucose level (blood sugar);
- Cholesterol and triglycerides;
- Mineral levels (Na, K, Ca, Cl, Mg);
- Blood type and Rh factor;
- Bleeding and clotting time (hemostasis), as well as numerous other analyses.

SPUTUM COLLECTION

The sputum is the secretion of mucus and other substances produced in the lungs, bronchi, and trachea, which can be coughed up, expectorated, or swallowed. The mucus secreted by the epithelial cells of the respiratory tract collects particles - dust and bacteria - found in the atmospheric air that enter the airways during inhalation, and upon reaching the oral cavity, mixes with saliva.

Mechanism of formation

Epithelial cells lining the walls of the respiratory tract secrete about 100 mL of mucus per day in healthy individuals. Constant movements of the cilia of epithelial cells propel the mucus towards the throat, where it collects and is usually swallowed. Larger amounts of accumulated mucus lead to the occurrence of coughing, which allows the mucus, as sputum (often mixed with saliva), to be expelled from the respiratory tract to the external environment.

Increased mucus secretion is caused by various factors, including tobacco smoke, dust, gases, vapors, smoke, cold air, inflammatory processes (such as respi-

ratory tract and lung inflammation), and damage to blood vessels in the respiratory tract (bleeding).

Clinical significance

Many respiratory diseases are accompanied by the presence of coughed-up sputum, which can be important in determining the diseases of these organs. Therefore, knowledge of certain physical, bacteriological, and chemical characteristics of sputum is particularly important in the clinical picture of certain diseases.

According to its appearance, fresh sputum can be:

- *Colorless, clear, and transparent*. This type of sputum mainly contains only mucus and is usually caused by viral infections, various fumes, seasonal allergies, inflammation of the throat, larynx, and bronchi (acute bronchitis), bronchial asthma, pulmonary edema (in the first stage), and smoking.
- *White, frothy sputum*. It most often occurs due to obstruction of the airways or lung edema.
- *Bloody sputum*, which represents discharge with blood admixtures and can be of various colors, from light pink to rusty. It occurs in pneumonia, tuberculosis, pulmonary edema, altitude sickness, etc. Blood in the sputum can be in small amounts, which have a streaky appearance, or in the form of clots, if it is a larger amount of blood. The coughing up of blood-streaked sputum is called hemoptysis.
- *Purulent sputum* is cloudy, yellow, or yellow-green in color. It is most often caused by bacterial infection and is coughed up by patients with bronchitis, bronchiectasis, and lung abscess. Purulent sputum has an unpleasant odor (foul-smelling).

According to the amount of expectorated mass, sputum can be;

- *Abundant sputum*, which occurs in patients with chronic bronchitis, bronchiectasis, or lung abscess.
- *Scanty sputum*, which occurs in patients with bronchial asthma, inflammatory diseases of the throat, larynx, and acute bronchitis (at the beginning of the disease).

Sputum laboratory examination

Macroscopic (visual examination): the color and appearance of the sputum are observed, and an assessment of the smell is made.

Microscopic examination: the sputum is fixed on a glass slide and stained with special dyes, then examined under a microscope (type, color, and appearance of cells). This analysis is done when there is suspicion of lung cancer.

Microbiological examination involves culturing the sputum on media to determine the type of bacteria or fungi. It is done in cases of pneumonia or respiratory tract infections, as well as tuberculosis.

How is sputum collected for examination?

1. Patient-collected samples
- It is collected in the morning, immediately after getting out of bed.
- Before collection, the patient must rinse the mouth and teeth several times with a toothbrush and then with plain water.
- By coughing, the sputum is collected in a purpose-made (sterile) glass or plastic container with a lid.
- • After collection, the container should be delivered to the laboratory for examination as soon as possible.

2. Doctor-collected samples

Sputum can also be sampled from bronchial secretions during bronchoscopy. This method provides more accurate results because there is a lower risk of contamination of the sputum with bacteria from the nasopharyngeal area compared to after coughing.

URINE COLLECTION

Urine is a liquid waste material, a product of the blood filtration in the kidneys. Most chemical substances encountered by the body can be detected in urine, as well as biological organisms, which can serve as indicators of the body's health or indicate infection.

Key components of urine are water, urea, and creatinine. By determining creatinine levels in blood and urine, kidney function can be assessed through creatinine clearance. This method can indicate kidney problems and determine the stage of the disease. Urine production is continuous; an individual produces about 1.5 to 2 liters of urine per day, which is referred to as diuresis.

Abnormalities in urine can include:
- Hemoglobin (hemoglobinuria)
- Red blood cells (hematuria)
- Proteins (proteinuria)
- Glucose (glycosuria)
- Albumin (albuminuria)
- Porphyrin (in porphyria)
- Ketone bodies (with exertion or diabetes)
- Phenylalanine derivative (in phenylketonuria).

Some of these substances can be found in trace amounts, which may not indicate disease as long as the levels are within normal ranges.

Urine is sterile until it reaches the urethra, which is normally inhabited by bacteria. To diagnose a urinary infection, the number of bacteria in a urine sample needs to be greater than 1,000/mL, along with a leukocyte count greater than 10,000/mL. Normal urine odor is described as specific, but it can be strong and

unpleasant in the case of an infection. The odor of urine can also change due to the consumption of certain foods or medications.

The pH of urine varies between 4.6 and 8, mostly below 7, indicating acidic urine. High acidity of urine can lead to kidney or bladder stones, often seen in individuals with hyperuricemia.

Healthy persons have yellowish-amber urine. The color depends on the level of hydration, which varies throughout the day and during activities, making urine darker when dehydrated. Various substances can change the color of urine.

Urine can be analyzed in the following way:

- Qualitative analysis: determines the presence or absence of certain substances or altered urine content.
- Quantitative analysis: provides information about the concentration of examined substances in urine.
- Microscopic analysis: examines the type and number of organized and unorganized elements in urine sediment.

It is common to perform a certain number and type of analyses collectively referred to as *routine urine analysis*. Routine urine analysis includes examining the physical properties of urine (volume, appearance, color, relative density, and pH) and its chemical composition (proteins, glucose, ketones, bilirubin, urobilinogen, erythrocytes, leukocytes, hemoglobin, and nitrites).

Urinary culture

Urinary culture is a method used to determine the number of bacteria in a urine sample. It is performed when there are symptoms indicating a urinary tract infection, such as pain and burning during urination, frequent and difficult urination with small amounts of urine, and pain in the lower abdomen or lower back.

Preparation for urine sampling

For the urine analysis and urine culture (microbiological examination), the most appropriate sample is the first morning urine. The sample is taken after washing with warm water and soap, using the midstream technique, which involves discarding the first stream and collecting the second in a sterile urine bottle. The sample should be delivered to the laboratory as soon as possible, preferably within 2 hours of collection. Until delivery to the laboratory, the sample should be kept in a cool place.

Image 16. Urine and urine culture bottles

BLADDER CATHETERIZATION

Image 17. Urinary catheter and urine bag

Urinary catheterization is the process of inserting a urinary catheter through the urethra into the bladder (image 17). Catheterization allows urine to flow freely. It can be used for urine collection, to enable urine drainage in cases of urinary retention, or for introducing fluids for diagnostic (contrast) or therapeutic purposes. Latex catheters are made of natural rubber and are used for single-use or temporary catheterization. For long-term catheterization, silicone catheters or catheters coated with substances that prevent bacterial adherence are used. The catheter size is also important and is measured in French units (F). One French unit corresponds to 0.3 mm. A catheter size of 18F (6mm) is commonly used. Catheterization is performed by a doctor or a nurse.

The urinary catheter is the most important risk and the greatest predisposing factor for hospital-acquired infections, so it should only be placed when absolutely necessary and removed as soon as possible.

Inserting the catheter

Inserting the catheter must be done using aseptic technique with sterile instruments, swabs, and gloves, along with cleaning the insertion site. The smallest possible catheter should be used. After insertion, it must be secured to avoid retraction and urethral injury.

Emptying the urinary bag

Emptying the urinary bag requires adequate procedures to minimize the risk of infection, as the urine bag is the most common source of infection. It is recommended to perform this procedure wearing sterile gloves and to wipe the valves on the bags before and after emptying them with swabs soaked in disinfectant.

STOOL (FECES) COLLECTION

Feces, or stool, is the final waste product of the digestive process. In addition to undigested food remnants, feces often contain additional "waste" from metabolism, such as organic acids, toxic substances, medications, or even fresh blood, mucus, parasites, and products of hemoglobin breakdown in the upper parts of the digestive tract. Foreign bodies that have been swallowed can also be found

in feces, such as toy parts in children or packages of narcotics, gold jewelry, or diamonds in smugglers.

The physiological process of expelling feces from the body is called **defecation**. Stool can vary in appearance from solid (formed) to loose and liquid (unformed). The color and odor of stool depend on the type of diet and accompanying disorders in the digestive tract. For example, black tarry stool is a result of fresh bleeding and the effect of stomach acid on hemoglobin in the upper parts of the digestive tract (ulcer in the stomach or duodenum, bleeding cancer, stomach injury).

A stool sample for analysis is collected in a sufficient quantity and placed in a sampling container with a screw-on lid. The container is labeled with the person's name, surname, and the date of sampling on the outside using a permanent marker. It is important to securely close the container.

Stool culture

Stool culture is a microbiological examination of a stool sample aimed at detecting bacteria that may be the cause of frequent stools or diarrhea).

The causative agents of diarrhea may include**:**

- Bacteria (such as Salmonella, Shigella, and others);
- Viruses (such as rotavirus, enterovirus);
- Fungi (e.g., Candida);
- Parasites (e.g., Giardia);
- - Various non-infectious causes, such as metabolic disorders and non-infectious inflammation of the intestines.

Bacteria are the most common cause of bacterial gastrointestinal infections, which occur by ingesting contaminated (infected) food (mostly of animal origin) or water. Intestinal infectious diseases are diseases in which pathogens or their products enter through the mouth, multiply in the intestines, and are most often excreted in the stool. After the symptoms of the disease have ceased, bacteria can continue to be excreted in the stool for a shorter or longer period of time, a condition known as carrier state. These patients, before entering a collective or working with food, must have three consecutive negative stool cultures. All intestinal bacteria are resistant in the external environment, which allows for the fecal-oral transmission of infection.

Fungi and viruses in stool. In addition to analyzing stool for bacteria and parasites, a mycological examination is also performed to detect the presence of fungi. Some types of fungi are part of the normal flora of the intestine; however, an increased number of fungi in the stool indicates a disturbance of the intestinal flora, most often due to prolonged use of antibiotics. Candida species are mostly isolated from the stool, but other species can also be found.

Common causes of acute diarrhea in children are rotaviruses, most often in winter months, as well as adenoviruses, which occur in summer. The diagnosis of these viruses is rapid, so the results are available on the same day.

For stool culture, a minimal amount of stool is taken in a sterile container with a spoon. The stool is taken from different places where a change is observed (pus, mucus, blood, loose stool). At least 3 consecutive stool samples need to be examined to confirm or exclude the presence of pathogenic bacteria. After appropriate therapy, the sample is re-examined until recovery. The minimum amount of stool for analysis is 2 mL.

Small amounts of blood can be detected in cases of occult bleeding from the digestive tract, which is significant as a cause of iron deficiency in the body, or as a sign of colorectal or colon cancer. Three consecutive samples are taken.

GENERAL RULES FOR MICROBIOLOGY SAMPLE COLLECTION AND TRANSPORT

The correct selection and technically proper collection of material are important prerequisites on which the correctness of microbiological results depends. Improperly selected, improperly taken, packed, or sent material are the most common causes of obtaining negative or incorrect results of microbiological analysis.

General principles of collecting material for bacteriological analysis:

- Collecting the right material, i.e., one from which the pathogen causing the disease is expected to be isolated;
- Collecting the sample at the right time, i.e., at the stage of the disease where the pathogen can be found;
- The material should come from the site of infection;
- Technically correct collection of material, ensuring that live microorganisms remain in the sample;
- Ensuring that the material is not contaminated during sampling;
- Containers used for collecting biological material, as well as all instruments used for sampling, must be sterile and for single use only;
- Two different materials from the same patient should not be collected in the same container;
- Swabs should be taken before antibiotic therapy;
- At least 12 hours should pass between the local application of an antiseptic agent (mouthwash, toothpaste, antiseptic lozenges, etc.) and the collection of swabs;
- After applying an antimicrobial agent, samples should not be taken for microbiological diagnosis, but only to check the efficacy of the therapy. In this case, specify on the form which drug the patient was taking;
- A control sample after antibiotic therapy should be taken at least 7 days after the end of the therapy or as requested by the physician;
- The collected material should be sent to the laboratory as soon as possible.

Packaging samples for bacteriological analysis:

Containers containing clinical samples must be adequately sealed and labeled (with the patient's name, protocol number, type of material taken, name of the clinic and department from which it is sent). Each sample must be accompanied by a properly completed requisition form.

DIET

The basic hospital diet represents the foundation of all therapeutic dietary regimens, with various forms depending on the patient's needs.

The liquid, so-called **tea diet** is a basic diet for patients after surgery. It contains nutrients in the form of clear solutions, providing 400-500 calories per day and is low in proteins, minerals, and vitamins. However, it is used because it does not irritate the digestive system or produce gases. It can be supplemented, in the later stages of recovery, by adding fruit juices and supplements to increase protein content and caloric value.

The next step is a **soft food diet**, which is similar to a normal diet but excludes fiber of plant and animal origin because it is difficult to digest. Solid food is gradually introduced until the patient's diet normalizes.

By making quantitative and qualitative changes, the basic hospital diet is transformed into a **specific therapeutic diet** by adjusting its energy value, changing the amount of fiber in the food intake, as well as the quantity of individual food components. Foods that trigger allergic and other reactions are excluded, and the number and size of meals throughout the day are adjusted.

The most common qualitative change is a **lactose-free diet** (for patients with lactose intolerance due to an inherited or acquired deficiency of the lactase enzyme necessary to break down lactose into glucose and galactose) and a **gluten-free diet** for celiac disease. Restricting gluten and gliadin intake may sometimes need to be extended to lactose, as celiac disease is often associated with lactose intolerance..

Based on their composition and usage possibilities, the following are used:

- Basic diets
- Diabetic diets
- Diagnostic diets
- Infant feeding recommendations

For patients whose health condition does not allow for a standard diet to be determined, an individual diet is prescribed by combining existing ones.

Therapeutic nutrition (or therapeutic diet) is a way of eating used in the treatment of various diseases and other health disorders, achieved by modifying and adapting the basic diet to the patient's current needs for therapeutic purposes. This method of eating is carried out to improve nutritional status, reduce the burden on the diseased organ, correct nutritional deficiencies, optimize body

weight, and eliminate ingredients that cause allergic reactions. Nutritional planning in hospitals is carried out by experts, based on the patient's clinical status, nutrition rules, and current good clinical practice recommendations for specific disease groups.

DISORDERS OF CONSCIOUSNESS

Disorders of consciousness can be quantitative and qualitative. Qualitative disorders of consciousness involve a global decrease in the level of consciousness (or a complete absence thereof). Depending on the degree of decreased functioning, qualitative disorders of consciousness are classified into the following categories:

– **Confusion or clouding of consciousness**

Confusion is the mildest form of altered mental status. The individual does not show the same level of interest in their surroundings as they would when fully conscious. Their field of interest in the environment is noticeably narrowed. The patient speaks almost spontaneously but is disoriented in time, space or toward people, responding listlessly and slowly, with hesitation and sometimes without any interest in the subject of conversation.

– **Somnolence**

Somnolence is a more severe degree of disorder. The person appears to be asleep. They can be easily awakened by superficial stimuli but remain awake for a short time. The patient appears sleepy, inert, and apathetic, with orientation broadly preserved but lacking active attention. Perception is incomplete, understanding is difficult, eyelids are closed, the face is relaxed, and the person seems sleepy. Person responds with effort to questions. They may perform simple actions, such as moving parts of the body, slowly, but then immediately return to a state similar to sleepiness.

– **Sopor**

Sopor is characterized by a significant reduction in consciousness function. The patient does not open his eyes to a call or rough stimuli. The person responds to questions with facial expressions or gestures, and less frequently with inappropriate words. All mental functions are minimally active. There may be partial or complete amnesia for the entire period of altered consciousness. In sopor (as well as in clouding of consciousness and somnolence), muscle reflexes, pupillary reaction to light, and corneal reflex are preserved.

– **Precoma**

Precoma is characterized by the patient not responding to a loud call. To pinch or a needle prick, this reacts with aimless, but basically defensive, movements of the limbs or heads. Deep muscle reflexes are extinguished but the corneal reflex is preserved. In the further course, this condition may have a tendency to turn into a coma.

– **Coma**

Coma is the most severe form of quantitatively and qualitatively altered consciousness. It is a state of complete absence of consciousness, and therefore, all other mental functions are inactive. The patient does not open his eyes even to painful stimuli and does not speek any words when asked. Contact with the person cannot be established. Reflex withdrawal of the threatened body part can be observed in response to extremely painful stimuli, but there is no awakening and no eye opening. In the deepest stadium of coma, a person reacts to touch or painful stimuli with automatism, extending the limbs which is called decerebration. The deepest stage of coma is when the patient does not open his eyes even to the roughest stimuli, does not make sounds and does not move his limbs to the roughest stimuli. But, all automatic vegetative processes, such as breathing, are preserved.

The terminal stage of coma, when almost all physiological functions of the body are extinguished, is called a carus. This is a prelude and indication of imminent death.

In clinical practice, neurologists and neurosurgeons are often able to assess the level of lesion in a comatose patient through clinical examination alone, which is even simpler with modern neuroimaging diagnostics (computed tomography and magnetic resonance imaging of the brain). Additionally, the **Glasgow Coma Scale** is often used to assess the quantitative dynamics of the change in consciousness level, consisting of evaluating and scoring the patient's eye opening, motor reactions, and speech functions. Patients with eight or less points on this scale are considered to be primarily vitally threatened, which has great prognostic significance.

PREPARATION OF INSTRUMENTS FOR STERILIZATION

After completing a minor or major surgical procedure, dressing change, or any other medical-technical procedure requiring surgical instruments, it is necessary to collect and prepare them for sterilization or reuse.

The procedure typically involves several steps:

– Used instruments are only handled with protective gloves on.
– Any larger deposits on instruments should be removed. The instruments are then rinsed.
– The next step is disinfection. It is done by immersing the instruments in a disinfectant solution (image 18) or by mechanical washing.

After the disinfection is complete, the instruments are taken out, rinsed with lukewarm water, and dried. They can then be wiped with a disinfectant (medic gasoline and 75% alcohol). Instruments treated this way are ready for packaging. Used instruments are only handled with protective gloves on.

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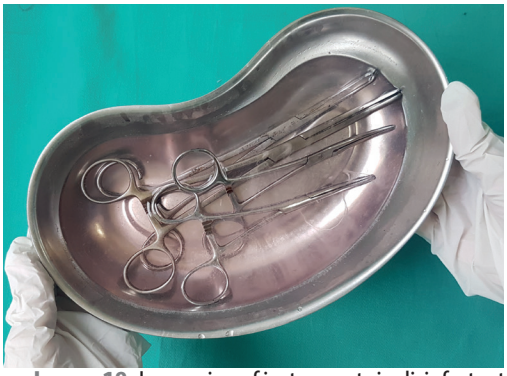

Image 18. Immersion of instruments in disinfectant solution

Sterilization in an autoclave is a widely used method for sterilizing instruments. The instruments are arranged in a metal box, leaving the lid slightly raised so that heated and saturated steam can penetrate the box. If the sterilized material is not used within 72 hours, the sterilization process needs to be repeated because the material is no longer considered sterile.

Dry heat sterilization is used in clinics, dressing rooms, and operating rooms. Washed, cleaned, and dried instruments are placed in metal boxes with the lid slightly raised. After both the sterilizer and the instruments have cooled down, the box is closed, and the instruments are ready for use.

Packages containing instruments (image 19) are stored in a special well-sealed cabinet where they are protected from moist air and potential oxidation..

Image 19. Packages containing sterile instruments

TAKING MEDICAL HISTORY AND PATIENT ADMISSION TO HOSPITAL

Every patient who requires hospitalization must go through the admission ward upon arrival at the hospital. After completing the initial examination and administrative formalities, they proceed to the sanitation area where they change into hospital clothing and undergo sanitation procedures, if necessary. Subsequently, the patient, accompanied by a staff member, is directed to the appropriate department, where they are handed over to a nurse. The nurse informs the patient of the layout of the rooms they will use during their stay, hospital regulations, and places them in a hospital room. The patient's temperature is recorded, and vital signs such as pulse, blood pressure, and respiration rate are measured and noted on a chart. The patient is instructed not to eat or drink anything the next morning due to laboratory tests (blood and urine, and other tests, if necessary). The attending physician takes a medical history and performs a physical examination, whreby documenting all the details in the patient's medical record.

Additional diagnostic procedures (such as X-rays) are ordered, and treatment, also documented in the chart (therapy chart, image 20), is initiated, or the patient is prepared for surgery. Daily examinations, required tests, and results are documented by the physician as *Decursus morbi*. Mandatory documentation includes

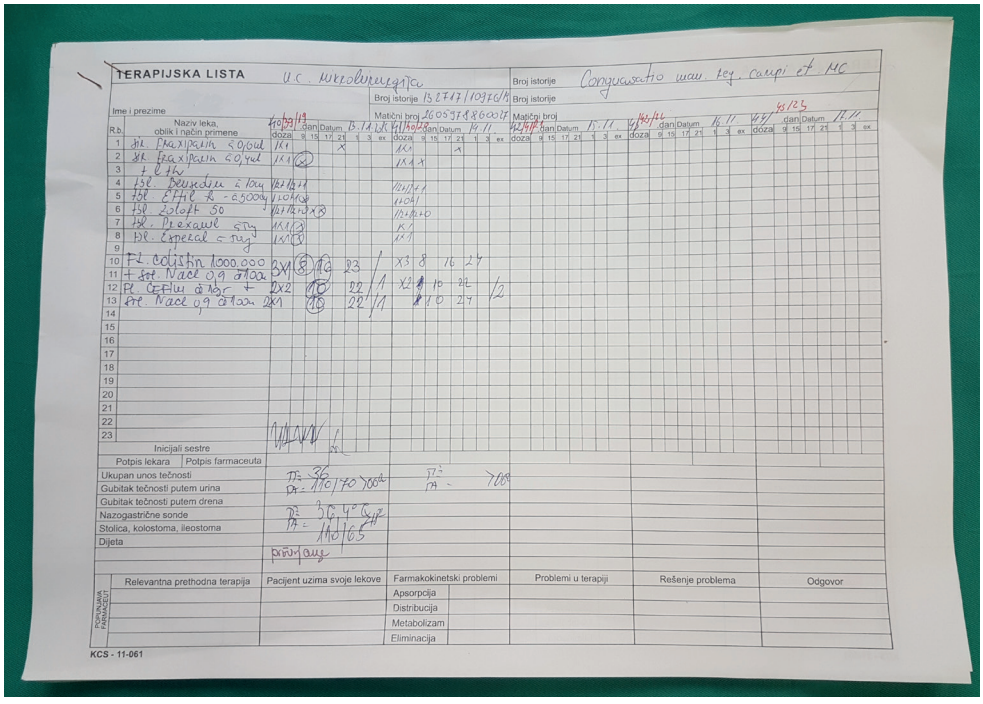

Image 20. Therapy chart

an operative report if the patient undergoes surgery. This process continues until the patient is discharged, at which point the physician writes a discharge

EMERGENCY ADMISSION OF PATIENTS TO SURGICAL CLINIC

In case of an emergency, medical history is recorded immediately upon admission, tests are taken immediately thereafter or even in the admission ward, and treatment is either promptly initiated or the patient is urgently sent to the operating room.

Often, these patients are critically ill, their breathing is compromised or they are bleeding. In such cases, a check is made for the detection of any foreign objects in the mouth (using a finger wrapped in gauze), the chin is lifted, the head is tilted back, an airway is inserted, and bleeding is stopped using one of the techniques that result in definitive hemostasis. A venous access is established by placing an intravenous cannula. Urgent blood tests are taken (complete blood count, blood type, and Rh factor). 0.9% NaCl solution is connected to the cannula. A urinary catheter is inserted. If possible, ECG and chest X-ray are done. If the patient has ingested something dangerous and immediate surgery is planned, gastric lavage is performed. If the patient arrives immobilized and is scheduled for an emergency surgery, immobilization is removed when they are transferred to the operating room.

MEDICAL RECORDS

1. **Protocol**

The information on all patients who have passed through the admission ward, i.e. who have been examined are recorded in the protocol, whether they stay in the hospital or not. The following data are entered in the protocol columns:

- Date
- Name, father's name and surname
- Year of birth
- Place of residence, street and house number
- Registration number and health identification code
- Category of health insurance
- Social Insurance Institute
- Diagnosis
- Therapy
- To whom, where and when have they been referred
- Date of revisit

2. **Medical history** (image 21)

The medical history is opened upon admission. The nurse or technician in the admission ward fill in the following data in the medical history:

- Name, father's name and surname
- Department to which the patient was referred
- Year of birth
- Address, social security number, health identification number
- Phone number
- Date of patient admission
- Diagnosis (referral and final)

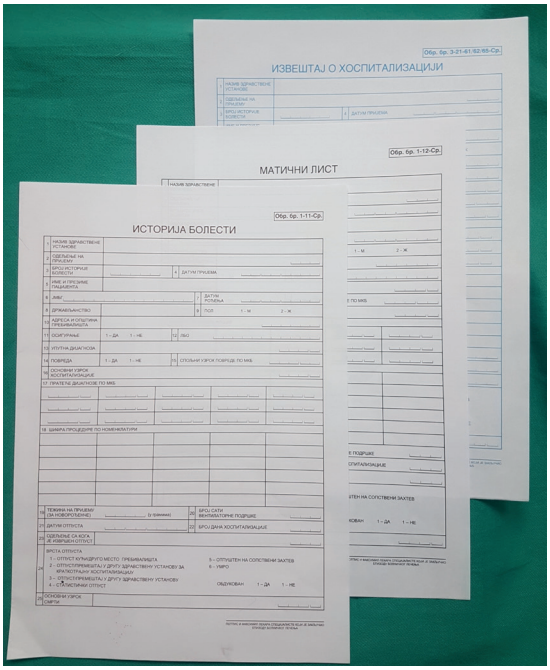

Image 21. Medical history

3. **Patient file**

This document is also mandatory upon admission. It has the same sections as the medical history. What sets it apart from the medical history is that it also includes sections for calculating hospital costs.

4. **Temperature chart** (image 22)

The temperature chart is an important document in which the following information is entered:

- Name of the healthcare institution
- Identification number
- Department
- Name and surname of the patient
- Year of birth
- Room and bed number
- Admission date and length of stay

These data are entered by the nurse or technician.
The physician enters the following information:

- Diagnosis upon admission
- Therapy
- Diagnostic procedures: CT scan, MRI, X-ray, ultrasound
- Findings upon admission: laboratory test results, findings obtained by the internal medicine specialist and anesthesiologist, blood type and Rh factor, ECG, chest X-ray

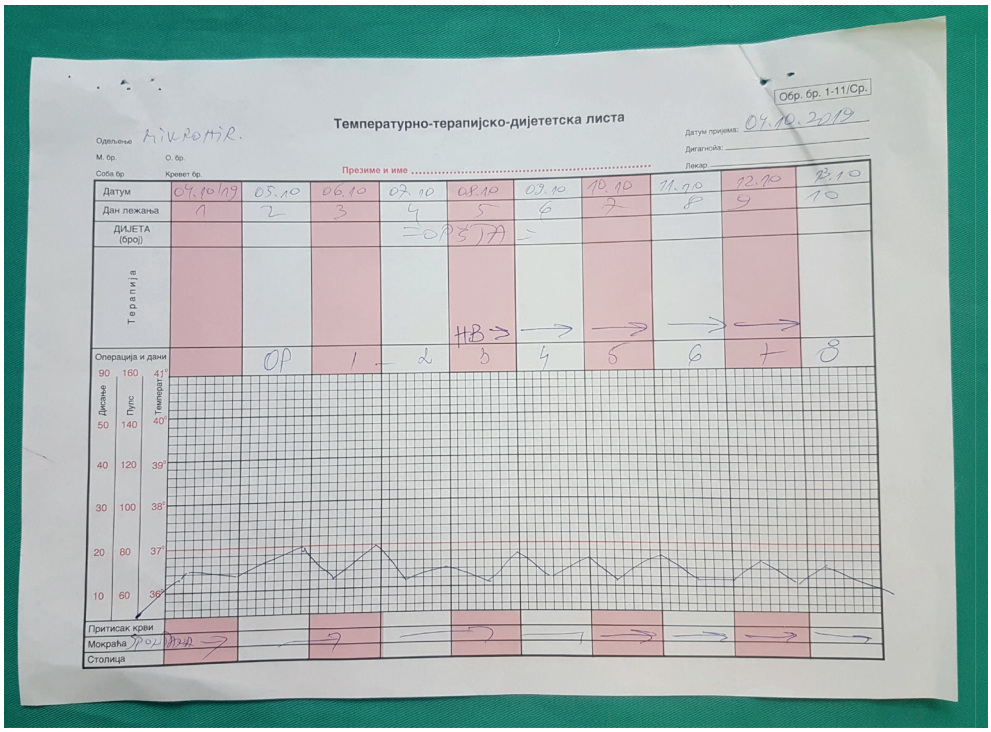

Image 22. Temperature chart

- Operative diagnosis, if the patient underwent surgery
- Recommended diet
- Other data, such as vital signs (temperature, blood pressure, pulse, respiratory rate), diuresis, stool, as well as data on the quantity and appearance of drained contents, recorded by the nurse or technician on a daily basis.

5. **Consent for surgery**
It is filled out and signed by the patient themselves, if they are able to do so, or the person accompanying them. In case of children, it is signed by the parents.

6. **Operating room protocol**
All patients who have undergone a procedure in that operating room are registered.

7. **Shift handover log book for doctors/nurses/technicians**
At the end of the shift, all relevant information from that day is recorded in the book, including the number of patients.

PERSONAL HYGIENE FOR BEDRIDDEN PATIENTS

The patient should be washed thoroughly every morning. Washing refreshes them and removes dirt, oil, and sweat, which can cause unpleasant odors. Additionally, washing and rubbing the skin help boost circulation. Patients who are able and allowed to get up should wash themselves in the bathroom. If a patient cannot or is not allowed to get up, they should wash themselves in bed using a basin. A caregiver should wash severely ill or weak patients. Every day, patient's teeth, face, neck, both arms, armpits, chest, and back down to the waist should be washed. Women should regularly wash the genital area. At least once a week, the patient should take a bath. If patients sweat heavily, their entire body should be washed daily. Severely ill bedridden patients should be washed from head to toe every day, and if they urinate or defecate in bed, they should be washed whenever needed, even several times a day.

Bathing a patient in the bathroom

if the patient is weak and instable while walking, they need assistance when entering and exiting the bathtub. A chair with a pillow or blanket on it is placed next to the bathtub. The patient sits on the chair, holds onto the bathtub with their hands, puts their legs in the water with assistance, and then sits on the edge of the tub. Assist patient to sit in the water by holding them under the armpits. After bathing, help them get out of the tub by holding them under the armpits. First they need to stand up and sit on the edge of the tub, and then on the chair. Assist patient to pat dry and dress, and then place them in made bed.

Bathing a patient in bed

If the patient cannot get up and wash in the bathroom or at the sink, everything needed for washing is brought next to their bed, where they wash themselves with the help of a caregiver.

If the patient cannot sit up in bed for washing, another person should give them a bed bath. The patient's room must be sufficiently heated, with windows closed. The patient's blankets are removed, and they are covered with only one sheet. Only one pillow is left under their head. The patient is undressed, and their face, neck, ears, arms, chest, abdomen, back, hips, thighs, and finally, the genital area are washed. Cover the person, exposing only the body parts being washed. Care should be taken to ensure there are no early signs of pressure ulcers.

TRANSFER OF BEDRIDDEN PATIENTS

In order to make the bed or ensure proper ventilation, the patient must be transferred to a sofa, chair, another bed, stretcher, etc. One, two, or more people can carry the patient, depending on the type of illness and the patient's weight.

One person can carry the patient only if the patient is not too heavy and if they have enough strength to put their arms around the caregiver's neck. In this case, the person carrying the patient puts one hand under the patient's lower back and the other under their thighs, while the patient wraps both arms around the caregiver's neck.

If two people are carrying the patient, both of them need to stand on the same side of the bed. One of them puts their hands under the patient's back and lower back, while the other one puts their hands under the patient's lower back and thighs. The patient wraps their arms around the neck of the first person.

If three persons are involved in the transfer, all of them need to stand on the same side of the bed. The first person puts their arms under the patient's back and lower back, the second person puts their arms under the lower back and thighs, and the third person puts their arms under the patient's knees and above the ankles. Lifting and lowering the patient should be done simultaneously and slowly. If the people lifting the patient lack practice, it is best to lift the patient on command: "ready, steady, lift".

DRESSING AND UNDRESSING PATIENTS IN BED

Patient linen should be made of soft material, clean and dry at all times. When changing the clothes of a very weak patient, is good for the clothing to be warmed beforehand. Patients who are able should dress themselves. When assisting a seriously ill patient, the following steps should be taken: when putting on a shirt, first put on the sleeves, then pull the shirt over the head and neck, lift the patient slightly, pull the shirt down and straighten it. If one arm is injured or ill, always dress the injured arm first, then the healthy arm.

When removing a shirt, the patient is assisted by lifting slightly with one hand, while the other hand pulls the shirt towards the back and neck, removing it over the head, and then off the arms. If one arm is injured, then the sleeve of the healthy arm is removed first, contrary to what is done when dressing.

Patients must change clothes frequently. Patients with less severe conditions usually change clothes twice a week, while seriously ill patients sometimes change clothes daily. Soiled patient and bed linens should be promptly removed from the patient's room.

When a patient gets out of bed, they should put on a dressing gown over the shirt they are wearing in bed, and put on socks and slippers. They should never be allowed to step on the floor with bare feet.

PATIENT TEMPERATURE MANAGEMENT (COOLING AND WARMING)

The application of **cooling devices** has a positive therapeutic effect because results in local tissue cooling. Initially, there is paleness may be the result of decreased blood supply to the skin, followed by local hyperemia. Metabolic processes are reduced, as are inflammatory processes. There is also a minor anesthesia of peripheral nerves, reducing the sensation of pain. It is used for fresh soft tissue injuries and fractures in the first 24-48 hours, as well as a form of therapy in physical medicine, known as cryotherapy. The application of cold packs is also used in cases of elevated patient temperature. Dry ice is used, but it must be strictly ensured that the therapy is intermittent and that the ice **never** comes into contact with the skin.

The application of **heating devices** also has a therapeutic effect. Hot packs increases metabolism and blood circulation. It can be used for chronic pain, muscle spasms, hypothermia in cases of shock, and during transportation of an injured patient. Warming procedures are also used in physical medicine (paraffin therapy). Before use, heat pack integrity test should be conducted, whereafter it needs to be put in a compress as it must not come into direct contact with the skin.

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