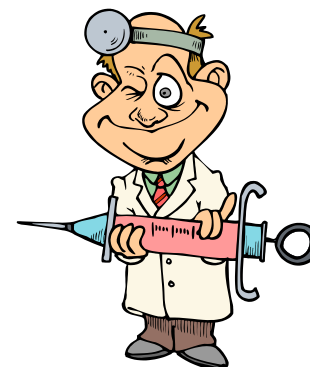


МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ И СОЦИАЛЬНОГО
РАЗВИТИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
КАЗАНСКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
КАФЕДРА ПРОПЕДВТИКИ ВНУТРЕННИХ БОЛЕЗНЕЙ

Общий уход за больным
Учебно-методическое пособие
Часть II

General Care of a Patient
Manual
Part II



Казань, 2005

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*"Experience is more important than study.
But without preliminary investigation you
will often make mistakes."*

*Theodor Bilrot
("Home Care of Patients", 1881)*

UNIT 4

Theme 1. BODY TEMPERATURE, TEMPERATURE TAKING AND NURSING THE FEVERISH PATIENTS

Goal: to get a notion about the device of thermometers, the rules of their storage, disinfection and temperature taking, types of fever, ways of feverish patients' care; to master skills.

Knowledge objectives:

- to know the fever's definition, its stages; temperature taking rules; mistakes in temperature taking; classifications of fever.

Skills objectives:

- to develop practical skills in temperature taking and registration on a temperature chart; care of feverish patients in different stages of fever.

Subject-matter:

- 1) the device of thermometers,
- 2) the rules of thermometers storage and disinfection,
- 3) the rules of temperature taking,
- 4) the types of fever,
- 5) the ways of feverish patients' care.

Equipment required: the maximal medical thermometer, the marked glass (jar) for disinfection of thermometers with 2% and 0,5% chloramine solution, a temperature chart.

*"The mankind has three main enemies at any rate:
Fever, Starvation and War.
It is Fever that one dreads most among them".
Sir William Osler, 1896*

Fever is the rise of body temperature that appears as protective-adaptive reaction of the organism in response to pathogens, is a non-specific attribute of many diseases. Fevers are divided by a level of the temperature rising and by character of fluctuations of a body temperature. There are rules of temperature taking which allow avoiding mistakes. The temperature must be registered on the temperature chart.

Signs of illness are specific and non-specific. The rise of body temperature higher than 37°C is a non-specific sign of illness.

Fahrenheit in 1723 was the first who offered to take temperature by means of medical thermometer.

Disturbances of thermoregulations, connected with change of a metabolism (accumulation of so-called pyrogenic substances - products of disintegration of fibers etc.) are the main reasons of the temperature rising. The maintenance of higher, than normal, temperature could be considered as the reaction to various irritators which leads to a thermoregulation reorganization. More often fever arises in infectious diseases, but the temperature rising can be only of the neurotic origin.

The medical maximal thermometer which has graduation from 34 up to 42 degrees on Celsius (°C) is used for temperature taking. It can be graduated also on Fahrenheit (Fig. 1).

The thermometer is called "maximal" because after temperature taking it continues to show that maximal temperature which has been found out in a person at measurement since mercury independently can not be lowered in the tank of the thermometer without its additional shaking.

One can choose from several types of thermometers. Today most thermometers have digital readouts.

Fahrenheit (°F)	Celsius (°C)
-----------------	--------------

107.6	42.0
105.8	41.0
105.0	40.5
104.0	40.0
103.0	39.4
102.2	39.0
102.0	38.9
101.0	38.3
100.4	38.0
100.0	37.7
99.0	37.2
98.6	37.0
98.0	36.6
97.0	36.1
96.8	36.0
96.0	35.5
95.0	35.0

Fig. 1. Fahrenheit-Celsius conversion.

Some thermometers take temperature quickly from the ear canal and can be especially useful for young children and the elderly. Others can be used rectally, orally or in an armpit. If a digital thermometer is used, read the instructions to know what the beeps mean and when to read the thermometer. Under normal circumstances, temperature tend to be highest around 4 p.m. and lowest around 4 a.m. (Fig. 2).

On the far left of the figure 2 there is a plastic strip with liquid crystals that react to heat. Moving clockwise, the others are a digital pacifier thermometer, a tympanic (ear) thermometer, a regular digital thermometer, and a mercury-free oral glass thermometer.

Due to the potential for mercury exposure or ingestion, glass mercury thermometers are being phased out. Digital thermometers with memory are created today which do not contain some mercury and a glass, and also thermometers for instant temperature taking (for 2 seconds) in sleeping children or in excited patients. Such thermometers appeared irreplaceable during recent struggle against “atypical

pneumonia” (SARS, Severe Acute Respiratory Syndrome) when the temperature was measured in hundreds of patients on transport streams (the airports, the railway stations).



Fig. 2. Types of thermometers.

Fever has *three stages* (periods) - the temperature rising, top of temperature (constant high temperature) and temperature falling. These stages in "classical" variant are submitted at the so-called continued fever which happens in pneumonia.

Principles of care of feverish patients depending on a stage of fever can be formulated as follows:

- in the first period of fever it is necessary "to warm" a patient,
- in the second period of fever it is necessary "to cool" a patient,
- in the third period of fever it is necessary to prevent falling of blood pressure, haemodynamic disturbances.

The temperature rising on 1°C is accompanied by increasing of frequency of respiratory movements (FRM) by 4 breaths and increasing of pulse by 8-10 beats per minute in adults and up to 20 beats per minute in children.

Rules of temperature taking

Thermometers are stored in a glass (jar) with a disinfectant solution (0,5% chloramine solution), a layer of cotton wool at the bottom of a glass. Before temperature taking it is necessary to take out the thermometer from disinfectant to dry it and to shake. The basic

place of temperature taking is the axillary area which should be dry (body sweat reduces temperature on 0,5°C). The temperature also can be taken in an inguinal bend (in children), in the mouth. In severely ill patients the temperature can be measured in the rectum where the temperature is usually higher by 0,5-1°C. Duration of temperature taking is not less than 10 minutes. Temperature is taken twice a day - in the morning on the empty stomach between 7 and 8 o'clock and in the evening before last meal between 17 and 18 o'clock. It is possible to take temperature every 2-3 hours in case of necessity. After taking the temperature thermometer is shaken and put into a glass with a disinfectant solution. Before giving the thermometer to another patient, it is rinsed with running water, carefully wiped and shaken up to column of mercury below 35°C.

Mistakes in temperature taking

1. A nurse didn't shake up the thermometer.
2. The hot-water bottle is put to the arm on which the temperature is measured.
3. Temperature taking in severely ill patients (bad pressing of the thermometer by a patient).
4. The tank with mercury was outside of axillary area.
5. Simulation of the temperature rising by a patient.

Temperature registration in a temperature chart

A patient's name, date and time (morning and evening) of temperature taking are fixed in the temperature chart. The results of temperature taking are marked with points. In connection of points with each other the temperature curves appear, they are analyzed by a doctor.

In a healthy person the temperature can change from 36 to 37°C, in the morning it is usually lower, and it can be higher in the evening. Usual physiological fluctuations of temperature within a day are 0,3-0,5°C. Age characteristic features of temperature: it is higher in

children; in the elderly and exhausted patients decrease of temperature is marked, and even severe inflammatory disease (for example, pneumonia) can proceed with normal temperature.

On a *temperature chart* on the ordinates axis (vertically) values of the body temperature are marked (the scale "T", every division is 0,2°C). On the abscissa axis (horizontally) the days are marked with the division into morning ("m.") and evening ("evg.") columns. Body temperature is marked by points (dark blue or black colour) which are connected by the direct lines. Thus *the temperature curve* is done. Its *type* has diagnostic value in many diseases.

Besides graphic registration of temperature, the curve of the pulse rate is built (the scale "P", red colour) and blood pressure is marked (the scale "BP"). Daily FRM, body weight (every 7-10 days), diurnal amount of consumed and urinal excretion (in millilitres) are expressed in figures on a temperature chart.

Classifications of fever

Fever is characterised *according to the degree of temperature rise* (by M.V.Chernorutsky):

- 1) *subfebrile* - temperature 37-38°C (it is usually connected with the keeping heat as a result of decrease of heat emission irrespective of presence or absence of the latent inflammatory foci);
- 2) *moderate (febrile)* - temperature 38-39°C;
- 3) *high (pyretic)* - temperature 39-41°C;
- 4) *excessive (hyperpyretic)* - temperature more than 41°C.

Hyperpyretic fever is a risk of a patient's life, especially of children's.

Temperature below 36°C is called *hypothermia*.

By the character of the daily temperature fluctuations the following *types* of fevers (types of temperature curves) are distinguished:

1. *Continued fever (acmastic fever, monoleptic fever)*. Temperature fluctuations within a day do not exceed 1°C, usually in the limits of 38-39°C. Such fever is characteristic of acute infectious diseases. In pneumonia, acute respiratory viral infections the temperature elevates quickly within several hours, in typhuses –

gradually, within several days: in typhus fever - for 2-3 days, in typhoid fever - for 3-6 days.

2. *Remittant fever*. Long fever with the daily fluctuations of temperature exceeding 1°C (up to 2°C), without fall to the normal level. It is characteristic of many infections, local pneumonias, pleuritis, and purulent diseases.

3. *Hectic*, or *exhausting*, fever. Daily fluctuations of temperature are significant - 3-5°C - with temperature fall to normal or subnormal figures. These fluctuations of temperature can occur two or three times a day. It is characteristic of sepsis, abscess (of lungs and other organs), milliar tuberculosis.

4. *Intermittent*, or *alternating*, fever. The temperature raises quickly up to 39-40°C and within several hours quickly decreases up to normal. In 1 or 3 days the temperature rise repeats. Thus more or less regular change of high and normal temperature occurs within several days. It is characteristic of malaria, the Mediterranean fever (periodic illness).

5. *Recurrent (relapsing) fever*. Opposite to the alternating fever, quickly elevated temperature is kept at this level within several days, and then temporarily falls down up to normal one with the subsequent new increase, and it occurs repeatedly. It is characteristic of recurrent typhus.

6. *Perverted fever*. In such fever the morning temperature is higher than that in the evening. It is characteristic of tuberculosis.

7. *Wrong fever*. Fever of uncertain duration with irregular and various daily fluctuations. It is characteristic of the flu, rheumatism.

8. *Undulant fever*. Change of the periods of gradual temperature increase (for some days) and gradual temperature decrease is marked. It is characteristic of brucellosis (abortus fever).

Rules of care of feverish patients

The I period of fever (fig. 3). In sudden temperature rise a patient suffers from chill, pains in the whole body, headache, he can not get warm.

A nurse should:

1. To calm and put a patient to bed, put a hot-water bottle to feet, cover a patient with a blanket, give fresh tea.
2. To supervise activities of daily living.
3. Not to leave a patient alone.
4. To eliminate draughts.

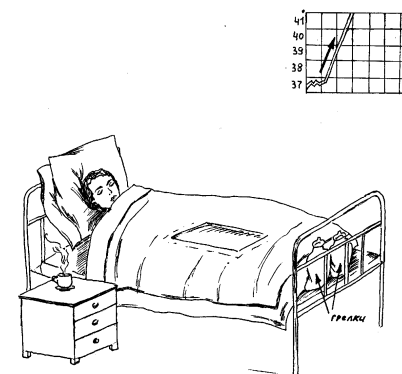


Fig. 3. The I period of fever.

The II period of fever (fig. 4). In continued high temperature a patient can be disturbed by high fever, the so-called irritative disorders of consciousness due to the expressed excitation of the central nervous system, manifestation of intoxication delirium (unreal sensation, hallucinations, psychomotor excitation (delirium), tossing and turning in bed.

A nurse should:

1. To organize an individual care.
2. To remove a blanket, to cover a patient with bedsheets.
3. To air a room avoiding draughts.
4. To control haemodynamic indices.
5. It is possible to put on or hang above the patient's head an ice-bag or lotions (i.e. a towel folded four times or linen cloth moistened in a solution of vinegar half-and-half with water and swung for 5-10 minutes). It should be changed regularly.
6. To look after the oral cavity, the nose and other organs, help in patient's activities of daily living, to prevent bedsores.

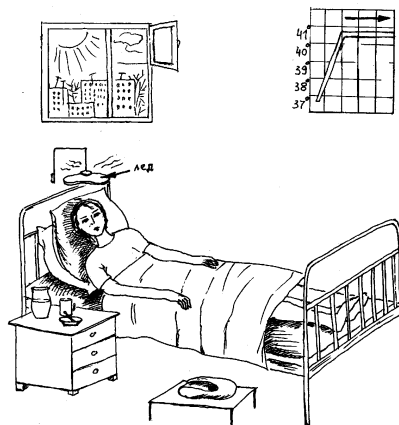


Fig. 4. The II period of fever.

The III period of fever (fig. 5). Temperature decrease can be gradual (*lytic*) or fast (*critical*). Critical temperature decrease is accompanied by excessive sweating, general weakness, pallor of skin and collapse (sharp vascular insufficiency) can develop. Blood pressure falling is a major diagnostic sign of collapse. Maximal (systolic), minimal (diastolic) and pulse pressure is reduced. It is possible to speak about collapse in the decrease of maximal BP up to 80 mm of Hg. Progressing decrease of systolic BP testifies the collapse gravity.

A nurse should:

1. To inform a doctor urgently about a patient's condition.
2. Not to leave a patient alone.
3. To remove rapidly a pillow, raise a foot part of a functional bed on 20° to give a patient the horizontal position with the raised legs.
4. To put on the arms and feet hot-water bottles in a towel.
5. To use oxygen humidified with water.
6. To change linen and bed-clothes, to sponge skin with dry napkins.
7. To control haemodynamic indices.

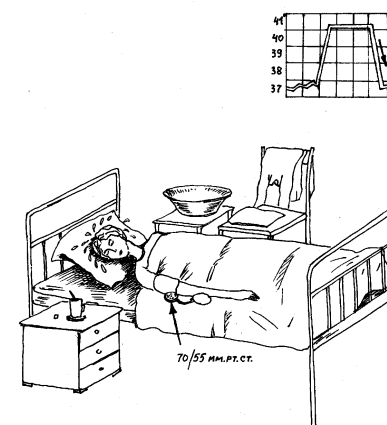


Fig. 5. The III period of fever.

PRACTICAL SKILLS

Temperature taking in an armpit

Equipment: the maximal medical thermometer, a glass (a jar, a vessel) with a disinfectant solution (3% chloramine solution), an individual napkin, a temperature chart.

1. To examine an armpit, to sponge it with a dry napkin.
2. To take a thermometer from a glass. In cases of skin allergic reactions at contact with chloramine solution, after disinfection it is necessary to rinse a thermometer under running water and sponge it dry.
3. To shake a thermometer for decrease of mercury column to a mark below 35° C.
4. To put a thermometer into an armpit so that the mercury tank from all sides touches a patient's body.
5. To fix a patient's arm or to ask a patient to keep a thermometer in fixed position by pressing of the bent arm.
6. To keep a thermometer for 10 minutes.
7. To take a thermometer out and remember the received results.
8. To shake mercury in a thermometer to a mark lower than 35°C.
9. To place a thermometer in a vessel with a disinfectant solution.
10. To register the result in a temperature chart.

Temperature taking in the rectum

Equipment: the maximal medical thermometer, a glass (a jar, a vessel) with a disinfectant solution (3% chloramine solution), Vaseline, medical gloves, a temperature chart.

1. To put a patient on his side with legs pressed to the stomach.
2. To put on rubber gloves.
3. To take a thermometer out of a glass with a disinfectant and wipe it dry.
4. To shake a thermometer to lower mercury column lower than 35°C.
5. To oil a thermometer mercury end with vaseline.
6. To introduce a thermometer into the anus to the depth of 2-4 cm and carefully press the buttocks. Buttocks should tightly touch one another.
7. To keep a thermometer for 5 minutes.
8. To take a thermometer out and remember the received result.
9. To wash carefully a thermometer in warm water and place it in a glass with disinfectant solution.
10. To shake a thermometer up to a mark lower than 35°C.
11. To disinfect a thermometer and gloves.
12. To fix the indices in a temperature chart with the indication of a place of taking.

Temperature taking in the inguinal bent (in children)

Equipment: maximal medical thermometer, jar with a disinfectant solution (3% chloramine solution), an individual napkin, a temperature chart.

1. In order to prevent skin allergic reactions in contact with chloramine solution after disinfection it is necessary to rinse a thermometer under running water.
2. To wipe a thermometer dry and shake it for the decrease of a mercury column below 35°C.
3. To bend a child's leg in coxofemoral joint so that a thermometer occurs in the formed skin bend.
4. To keep a thermometer for 5 minutes.
5. To take a thermometer out and remember the received data.
6. To shake a thermometer to a mark lower than 35°C.

7. To place a thermometer into a jar with disinfectant solution.
6. To register the result in a temperature chart with the indication of a place of taking.

Oral temperature taking

1. To place the bulb under a patient's tongue.
2. To ask a patient to close the mouth for three minutes approximately.
3. In using a nondigital thermometer, rotate it slowly after removing it from the mouth until you can read the temperature.

CONTROL THEMES FOR DISCUSSION

1. Fever's definition.
2. The fever's periods.
3. Rules of temperature taking.
4. Mistakes in temperature taking.
5. Types of fevers.
6. Care of feverish patients in the I period of fever.
7. Care of feverish patients in the II period of fever.
8. Care of feverish patients in the III period of fever.

UNIT 4

Theme 2. METHODS to INFLUENCE on BLOOD CIRCULATION

Goals of the class: to get a notion about the mechanism of action of elementary physiotherapeutic procedures and to master skills.

Objective of the class:

- to know the rules of preparation of a patient, technique of applying cups, mustard plasters, warming and cold compresses, giving a hot-water bottle, an ice-bag, medicinal leech application;
- to develop skills in applying mustard plasters and cups, compresses (warming, cold) and poultices, bloodletting, hirudotherapy, performance of balneologic procedures (medical baths).

The subject-matter of the class:

- 1) the mechanism of action of the elementary physioprocedures,
- 2) technique of procedures performance,

3) practical skills.

Equipment required: gauze, cotton wool, compress paper, oilskin, cellophane, bandage, cups, pincers, mustard plasters, hot-water bottles, an ice-bag, alcohol, matches, test tubes.

EDUCATIONAL MATERIAL

Various physical factors (cold, warmth, mechanical irritation) in influence on human skin cause a certain functional transformation in the organs and tissues located deeper than the irritated parts of skin. Change of a vascular tension, secretory and motor activity and cellular metabolism take place. Besides that the patient's sleep is improved, appetite becomes better, the mood is cheerful. Such medical action of natural factors on skin with the purpose of changing the functional condition of the underlying organs and systems has got the name of physiotherapeutic procedures (Greek "physis" - nature, natural properties). Application of mustard plasters and mustard baths, cups, compresses, hot-water bottles etc. can also be referred to them. As physiotherapeutic procedures can cause serious complications, the nurse should know the mechanism of action, indications and contraindications to the application of these procedures and master the performance technique.

Mustard plasters

Working substance of mustard plasters is allylisothiocyanat («ethyl mustard oil») which is separated from mustard at 40°-45°C. It causes irritation of skin receptors and its hyperemia, leading to dilatation of the blood vessels, located below internal organs. Thus the analgetic effect is achieved; resorption of some inflammatory processes is accelerated. Mustard plasters are applied in the treatment of neurological diseases (myositis, neuralgia), catarrhal diseases (bronchitis, pneumonia) as well as in angina pectoris.

Standard mustard plasters - sheets of compact paper (8x12,5 cm) covered with a layer of defatted mustard powder (storage time 8-10 months), or sacks out of the pressed filter paper between the layers of which there is mustard powder. The suitable mustard plaster for use has a sharp smell of mustard oil and does not crumble. It is necessary to

check up these qualities. Before the use a mustard plaster is moistened in warm water (40°-45°C). At a higher temperature mustard oil is destroyed. Mustard plasters are applied for 10-15 minutes, thus a patient must feel heat and slight burning, and the skin must become hyperemic (reddened). In longer application of mustard plasters skin burn is possible.

Places of application of mustard plasters: back of the head, a collar zone, chest area (behind, in front, lateral surface), lumbar region, gastrocnemius muscles, V-th intercostals area (fig. 6). It is necessary to avoid applying mustard plasters on the area of nipples, mammae, spine and birthmarks. On the area of heart a mustard plasters are applied only in case of pain in the heart area.

Contraindications: diseases of the skin (pyoderma, neurodermitis, eczema), high fever (higher than 38°C), pulmonary bleeding or probability of its development, malignant tumors.

Application of mustard baths is possible (50 g of mustard powder per 10 l of water) – baths (in cold diseases) and local - foot baths (in the treatment of hypertension). The duration of a bath is 20-30 minutes. After a bath patients have to be washed off with pure warm water, wiped dry and then wrapped up with a bed sheet or a blanket.

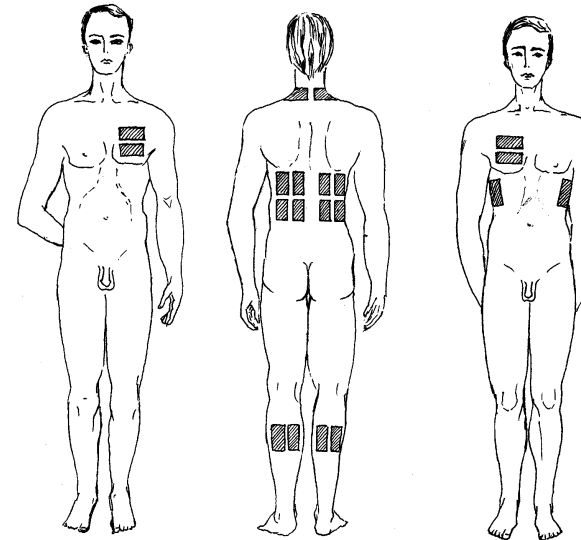


Fig. 6. Places of application of mustard plasters.

Application of cups

Cups are the glass vessels having the form of a pot with rounded, thickened edges and a semicircular bottom, volume 30-70 ml.

Cups render strong vasodilating and anti-inflammatory action, they are widely applied in bronchitis, pneumonia, neuralgia, neuritis, myositis.

The flame of match creates rarefaction in a cup. Due to negative pressure (vacuum) created in a cup it sticks to a skin, occurring the *rush of blood and lymph in skin and in the lower organs*. It causes reflex influence on the vessels of internal organs – blood and lymph circulation increases and tissue trophicity (feeding) improves, promoting faster resorption of the inflammatory foci.

There is also another component in the mechanism of cups' effect. Skin capillaries, being overfilled with blood, are broken off and small skin hemorrhages (bruises) appear. Therefore the skin gets bright red or crimson coloring. In places of hemorrhages products of disintegration and autolysis (self-digestion) of blood are formed. Practically these products are *biologically active substances* which are carried by the blood flow and have beneficial (stimulating) effect on various tissues and organs. The described mechanism of influence on an organism through the formation of hemorrhages is actually a variant of autohemotherapy. Autohemotherapy (Greek "autos" - himself, "haima" - blood, "therapeia" - care, treatment) is an intramuscular or hypodermic introduction to the patient his own blood (taken from a vein) to stimulate protective functions of the organism and improve metabolic processes; a method of treatment of languidly proceeding infectious and other diseases (for example, furunculosis).

For application of cups a patient is laid in bed on a stomach (in applying cups on the back), thus his head should be turned aside, and hands clasp a pillow. If the skin is covered with hair, it is shaved off, washed with warm water and soap and wiped with a towel.

A thin layer of Vaseline is put on the skin so that the edges of cups closely adjoin the body surface for the air not to penetrate under a cup as well as to prevent a burn.

Air rarefaction is created by bringing into cups a burning alcoholic tampon. This manipulation demands skill as insufficient

burning of a tampon will not create air rarefaction and cups will not stick to skin, while excessive heating can result in a burn.

It is important to understand, that it is necessary to heat only *the air* in a cup but not its *edges*, in order to avoid skin burn. If you don't want to burn a patient, it is necessary to wring out unnecessary liquid from a tampon on the edge of a bottle with spirit. Then the bottle with spirit should be tightly closed and set aside. In wrong application of cups there can be complications: hitting of drops of burning alcohol on the patient's skin.

Cups are put on those parts of a body where there is a good muscular layer and subcutaneous fatty layer, smoothing bone formations – subclavicular, subscapular, intercostal areas (fig. 7). It is forbidden to put cups on the heart area, mammary glands, spine, and birthmarks.

Contraindications: high body temperature, malignant tumors, the active form of tuberculosis, pulmonary bleeding or danger of its development, diseases of skin and hypersensitivity, heavy exhaustion of a patient with the loss of skin elasticity, state of strong excitation.

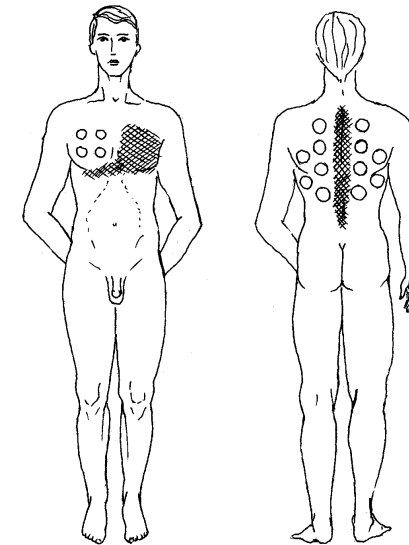


Fig. 7. Places of cups application
(Places where it is impossible to put cups are shaded).

Bloodletting

Bloodletting is a removal of a certain amount of blood from the blood system to reduce the volume of circulating blood, arterial and venous pressure. It is performed in acute left ventricular failure (pulmonary edema) if there are no shock or collapse signs; in hypertensive crisis, in pulmonary hypertension, in polycythemia (the increase in the amount of blood cells), in poisoning with some toxins. Now with the appearance of highly effective medical remedies bloodletting is rarely used. Nevertheless in certain situations only bloodletting can improve a patient's state or even save his life.

Contraindications: hypotension, hypovolemia (reduction of the total amount of circulating blood), anemia, marked disturbances of blood coagulating system, hepatitis.

The bloodletting is carried out by means of venipuncture or venisection, 200-400 ml of blood is removed. Procedure has to be carried out slowly and carefully to prevent complications (syncope, hypotension etc.).

Hirudotherapy (application of medicinal leeches)

Hirudotherapy is carried out for the local blood removal, and for decrease of blood coagulability (anticoagulative effect). Together with a secret of leech salivary glands hirudin¹ and histamine-like substances dilatating the lumen of fine vessels and increasing bleeding get into the patient's organism. Hyaluronidase enzyme promoting the penetration of various substances into the organism and increasing permeability of tissues and capillary walls was found out in the extracts of whole leeches. Though medicinal leech treatment is considered to be one of the methods of physiotherapeutic treatment, it is practically a medicamentous procedure. According to Oxford Medical Dictionary (2002), «formerly widely used for letting blood, medicinal leech may now be used following microsurgery (e.g. to replace a severed finger)

to restore patency to blocked or collapsed blood vessels and thus encourage the growth of new capillaries». The Hirudin extracted from leeches and synthetically produced preparations are currently used in the treatment of patients - «Hirulog» for subcutaneous injections, «Pijavit» (from Russian “pijavka” – medicinal leech) for the internal use etc.

Indications: hypertension, venous congestion in the liver, ischemic heart disease (stenocardia [angina pectoris], myocardial infarction), vein thrombosis and thrombophlebitis, hemorrhoids.

Contraindications: anemia, low blood coagulability, treatment with anticoagulants, hypotension, the purulent - septic and allergic diseases, hypersensitivity, pregnancy.

Possible complications: a skin pruritus (to eliminate itching nurse should oil the skin around a wound with a mixture of ammonia spirit with vaseline oil in equal proportions); in application of leeches on a superficial vein - bleeding (to stop bleeding a pressing bandage is used); pyoderma, furunculosis, arising in non-observance of antiseptics and aseptic rules; haemorrhages in hypodermic cellular tissue.

Medicinal leeches - *hirudo medicinalis* (a class of annular worms) - are used for procedures. There are more than 10 types of medicinal leeches, but only one - an ordinary medicinal leech is used. It dwells in fresh reservoirs. In contrast to other kinds, a medicinal leech has two orange strips on the back, its color is dark-olive; a healthy leech has a characteristic shine. A leech sucks blood only with the help of a front sucker which has chitinous denticles due to which a leech cuts the skin of a patient on the depth up to 1,5 mm.

In application (Latin “application” - the applying) on the skin of a person one adult leech can suck away 10-15 ml of blood. Process of sucking lasts from 20 to 90 minutes. Duration of bleeding from a wound is 6-24 hours, the total amount of flowing out blood is 10-40 ml. 8-10 leeches are applied simultaneously.

Way of storage of leeches: in pure well, spring or running water, at temperature from 10 to 18°C, in broad neck glass pots reliably closed by a gauze to exclude an access of air, in the darkened place. Water has to be changed once a day; pots have to be washed and half-filled with water. It is necessary to reject sick leeches according to the signs: knotty, flabby, languid, slime, ulcerous body, deprived of characteristic

¹ Hirudin - powerful anticoagulant (anticoagulative substance) presenting in the salivary glands of leeches and in certain snake venoms that prevents blood coagulation by inhibiting the action of the enzyme thrombin.

shine; ulcers on a body; loss of aggression and activity.

Attributes of a «healthy» leech to be used:

- 1) a smooth, brilliant body without slime;
- 2) the expressed reaction to a touch - elastic contraction, body shortening;
- 3) aggressivity (immediate suction of a leech to the hand inserted into a pot);
- 4) activity (intention to leave the pot).

The leech can be used only once!

Places of application of leeches (fig. 8):

- area of a mastoid process, 1 cm behind the internal edge of the floor of the auricle (in thrombosis of brain vessels, hypertension);
- area of III-V intercostal space, 1 cm outward the left edge of the breast bone (stenocardia, myocardial infarction);
- right hypochondrium space (venous congestion in a liver);
- along the affected vein, 1 cm to the sides from its edges in every 5 cm in a chess order (thrombophlebitis);
- around the coccygeal bone (hemorrhoids).

It is necessary to remember, that it is impossible to put leeches on the place where hypodermic veins are visible or arteries are near as leeches can bite through them that will cause an undesirable profuse bleeding.

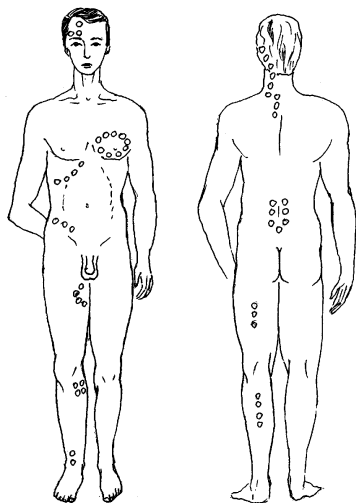


Fig. 8. Places of leech application.

Application of leeches

Equipment: a clean vessel (a test tube, pot), a sterile tray, alcohol, 5% alcoholic solution of iodine, hydrogen peroxide, glucose solution, formalin or ammonia spirit, hot water, sterile napkins, tampons, sticks with cotton wool, dressing material.

1. To prepare a patient (recumbent or sitting position depending on a place of application of leeches).

2. To prepare skin: to shave hair, to wipe carefully with alcohol (hydrogen peroxide); to wipe several times with a tampon moistened in hot water; then it is better to moisten the site intended for application with glucose solution (for better leech sticking).

3. To select and put into a small clean vessel leeches taken from a pot exceeding the required number by 2-3 leeches. Leeches are selected with an aquarium net or by putting a hand into a pot. A leech creeps into a warm palm without sticking to it, as the palm skin is rougher. One can't take a leech with pincers as it can injure the leech nerve ganglion causing paralysis.

4. To pull out leeches from a vessel one by one and to place it to a test tube. Under an inclination to bring a test-tube to a site of a body (fig. 9) and with movement of leech to direct it with a tampon moistened in hot water (but lower than 90°C).

5. When a leech sticks (bites through a skin and begins wavy movements), to remove a test tube and to lay a napkin under an opposite (back) sucker.

6. It is necessary to dispose leeches freely, without overlaying one against the other. In premature discontinuation of suction (sleeping) it is necessary to pass a cotton wool moistened in warm water over a leech's body. As a result of blood suction a leech falls off itself. It is impossible to tear off leeches as there will be an undesirable bleeding!

7. To apply a dry aseptic bandage with a considerable amount of hygroscopic cotton wool after falling off the leeches. If it's necessary (in considerable soaking of bandages with blood) a bandage is changed. Change of a bandage is made in 24 hours.

8. To destroy the used leeches in a solution of formalin (or ammonia spirit).

If (for some reasons) a leech should be taken off earlier, it is

necessary to wipe a skin of a patient in a place of sticking with a tampon moistened in one of the following solutions: in alcohol, iodine tincture, 10% calcium chloride solution or 10% (hypertonic) sodium chloride solution.

Wounds from the bites usually heal in 2-3 days. If after the removal of a bandage a wound continues to bleed, it is necessary to apply a *pressing* bandage. It is possible to stop bleeding with potassium permanganate solution. In absence of bleeding to treat a wound and around it with 5% iodine tincture or alcohol, hydrogen peroxide and to apply a dry bandage.

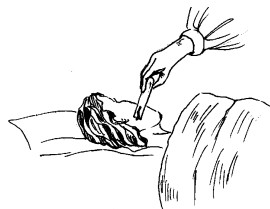


Fig. 9. Leech application to the mastoid process.

Compresses

A warming compress is a local dilatation of blood vessels and increase of blood circulation in tissues, which in the of inflammatory processes in this area produces soothing and resolving action.

Indications: local infiltrates (postinjectionous), diseases of muscles and joints.

Contraindications: skin diseases (dermatitis, furunculosis), lesions of skin integrity.

There are 2 kinds of warming compresses: dry and wet.

The dry compress is done as a cotton-wool-gauze bandage to protect some parts of a body against cold.

The wet warming compress consists of 3 layers: a piece of clean compact fabric moistened with a solution (used solutions are given below), then an oilcloth, a polyethylene cloth or waxen paper, the last layer - cotton wool are applied. Each subsequent layer should be larger than the area of the underlying one (fig. 10). From above the compress is fixed with gauze bandage. Solutions for a compress: warm water, a weak solution of vinegar (1 tea spoon per 0,5 l water), vodka, eau de-

cologne, alcohol diluted with water. Duration of application of a damp compress should not exceed 12 hours, and in 6-8 hours the change is made. Upon termination of procedure the skin is wiped with water or alcohol with the subsequent drying by a towel.

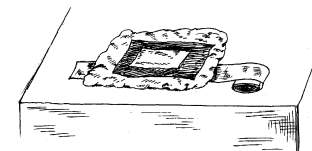


Fig. 10. Warming compress.

Cold compresses (lotions) are applied in contusion, traumas (applied immediately), and bleedings. They cause local cooling and narrowing of blood vessels, diminish bloodfilling and pains. The gauze combined into some layers, is moistened in cold water and applied for 2-3 minutes, then the gauze is repeatedly moistened and again applied to a place of damage, and so up to the subsiding of pain and reduction of edema.

An ice-bag is applied for the longer cooling; it is a flat rubber sack with a wide opening with a lid filled with pieces of ice before use. It is indicated in internal bleedings, in delirium against the background of feverish condition, at the initial stage of some severe diseases of the abdominal cavity organs and contusions. The ice-bag is put through a towel. To prevent overcooling or pain from pressure the bag can be suspended above the damage area. In every 30 minutes of the procedure ice-bag has to be removed for a 10-minute breaks.

Poultices are applied in infiltrates of prolonged resorption, old hematomas, radiculitises. Heated sand, steamed out linen seed, bran and oats, placed in special linen sacks are used. Warmed up linen sack is applied to a body, covered with an oilcloth, fixed, covered with a blanket.

Contraindications: abdominal pains of unknown origin, malignant tumours, the first day after a trauma, the external and internal bleedings, the impaired skin sensitivity, unconsciousness of patients.

Hot-water bottles are applied to produce a local warming effect, as

soothing and spasmolitical remedy. There are rubber hot-water bottles (water), electrothermal (thermophore) and chemical ones. Before use a hot-water bottle is filled with hot water for 3/4 of its volume, then the air is carefully removed, the plug is tightly turned up, the hot-water bottle is overturned to check its hermetic tightness. Before giving it to a patient a hot-water bottle is wrapped up in a towel. In frequent and prolonged use of a hot-water bottle the skin of a patient is oiled with vaseline to prevent burns and hyperpigmentation. Contraindications are the same as for poultices.

Balneologic procedures (balneotherapy)

Baths, douches (shower), rubdowns, wet packs refer to balneologic procedures. Cold (up to 20°C) and cool (20-30°C) water causes skin angiospasm, slowing of heart rate, blood pressure increase, increase of skeletal muscles tension and smooth muscles of the viscera. Balneotherapy of such water temperature is applied with the aim of body strengthening, to stimulate central nervous system functions, to improve increase of a metabolism. Indifferent (34-36°C) water produces appreciable sedative, relaxing effect. Warm (37-39°C) and hot (above 40°C) water provides a distinct stimulating action, dilatation of skin vessels, heart rate increase, blood pressure decrease, muscular tension reduction, relaxation of smooth muscles of the viscera, and perspiration increase.

Baths differ according to the prescription (hygienic and medical), areas of the use (general and local), composition - pearl baths (air bubbles under the pressure), foamy (lather substances), vibrating and vortical (strengthening of the water mechanical factor), aromatic (coniferous, sage etc.), mineral (hydrogen sulfide) etc. Bathing procedures can be short-term (up to 5 minutes), average duration (10-20 minutes) and prolonged (up to several hours).

Contra-indications: heavy atherosclerosis, hypertension, heart failure, infringement of cerebral and coronary blood circulation disorder, active tuberculosis.

In the use of medical baths and other water procedures it is necessary to watch closely on the condition of a patient which sometimes can suddenly deteriorate because of blood pressure, heart

rate and breath change.

PRACTICAL SKILLS

Application of mustard plasters

Equipment: mustard plasters, a tray or a plate, water of 40-45°C temperature, a towel, a blanket.

1. To dip a mustard plaster quickly (some seconds) into a warm water (temperature not higher than 45°C).
2. To apply a mustard plaster to the skin by the side covered with mustard (in the raised sensitivity of a skin - through a gauze).
3. To cover the area of application with a towel, then with a blanket.
4. Duration of procedure - 10-15 minutes.
5. Upon termination of the procedure to take off mustard plasters with a wet napkin, to remove the rest of mustard powder, to wipe skin dry, to cover a patient with a blanket.

Application of cups (cupping)

Equipment: a tray (enameled or wooden) for cups (10-16 cups), tube with vaseline, a bottle with 96% ethyl alcohol, a wick (a metal probe with cutting on the end and cotton wool tightly wound around it) or Kocher's forceps (with wound cotton wool), matches, cotton wool.

1. To wash cups carefully before the use with hot water, to wipe dry.
2. To check up the edges of cups on the presence of splits and other damages and to oil with a thin layer of vaseline.
3. To lay a patient in a comfortable position.
4. To oil the skin with vaseline before applying cups.
5. To moisten a cotton wool tampon on a wick or Kocher's forceps in alcohol and to wring out.
6. To close a bottle with spirit and set aside.
7. To set fire to a wick.
8. To take a probe with burning tampon into the right hand, and 1-2 cups into the left one.
9. To place a burning tampon inside a cup, holding it close to a body, for a very short time. Thus the edges of a cup should not be

touched and overheated (time sufficient to achieve vacuum inside a cup is 1 second).

10. To apply a cup to skin with quick, vigorous movement.
11. To cover a patient with a blanket.
12. Duration of the procedure is 10-15 minutes.
13. To remove cups: to press a skin slightly at edges of a cup with the left hand fingers and move its bottom to the opposite side with the right hand.
14. Upon termination of the procedure to wipe the skin from vaseline with the towel, to cover a patient with a blanket. After the procedure a patient should lay quietly not less than an hour.
15. The used cups must be washed up with hot water and wiped dry.

Bloodletting

Equipment: needles for venipuncture, rubber tourniquet, the graduated jar for blood, sterile napkins, alcohol, iodine, special cylinder with an oilcloth.

1. To lay a cylinder covered with an oilcloth and a sterile napkin under the ulnar flexion.
2. To treat a place of bloodletting with alcohol (iodine can't be used). Nurse must treat her hands (succession: washing, alcohol, iodine).
3. To tighten a patient's hand with a rubber tourniquet above the ulnar flexion for 1-3 minutes before introduction of a needle. The pulse thus should be felt, veins - obturated.
4. To do bloodletting, to introduce a needle by the blood flow with a cut upwards.
5. Do not take off the venous tourniquet! To take off a needle after removing from the blood flow 200-400 ml of blood (depending on the indications).
6. To apply a sterile napkin and an aseptical bandage on the place of bloodletting upon the termination of the procedure.

CONTROL QUESTIONS AND THEMES FOR DISCUSSION

1. Indications to application of mustard plasters, the mechanism of influence.

2. Indications and contraindications for application of cups.
3. In what diseases is bloodletting used?
4. Characteristics of the medicinal leeches used in hirudotherapy.
5. Kinds of compresses.
6. Hot-water bottles, indications for application, contraindications.
7. Kinds of baths.
8. Temperature of water in balneotherapy and its influence on body functions.
9. Kinds of balneologic procedures.
10. Contraindications for balneotherapy.

UNIT 5

Theme 1. WAYS OF MEDICATION'S ADMINISTRATION

Goal: to get a notion about ways of medications administration, disinfection, sterilization and methods of presterilizing cleaning of medical products; to master skills.

Knowledge objectives:

- to know about enteral and parenteral ways of administration, technique of subcutaneous, intramuscular and intravenous injections and intravenous infusions, sterilization, modes of sterilization of separate objects, presterilization cleaning of medical objects; rules of taking and storage of medical objects, measures of prevention occupational diseases of nurses working with internal fluids.

Skill objectives:

- to develop skills of the distribution of medicines and the application of topical medical agents; to master the technique of subcutaneous, intramuscular and intravenous injections and intravenous infusions.

Equipment required: tables, ointments, drops, powders, tablets, suppositories, capsules, injection solutions in ampules and bottles, syringes of various volume, systems for intravenous infusions, droppers, cotton wool, glass sticks, metal probes, cotton balls, Esmarch mug and phantom.

EDUCATIONAL MATERIAL

Medications are used in the treatment of the most diseases nowadays. The knowledge of various ways of application of medications is necessary for the future doctors for the following reasons:

1. A doctor should choose a proper way of giving medications to provide its best assimilability with an organism and achieve expected effect.
2. Wrong introduction can result in severe complications with a risk of a patient's life.
3. A doctor should be able to select a way of administration of a medicine, depending on patient's condition to avoid additional sufferings.

External medications application

Medication is put *on the skin* in the form of ointments, emulsions, solutions, tinctures, and powders. Application is meant basically for the local action of preparations. Through the intact skin only the fat-soluble substances are absorbed, basically through excretory ducts of the sebaceous glands and hair follicles.

Ways of application: greasings, compresses, lotions, powders, different bandages on wounds and embrocations. It is necessary to apply medication always on the clean skin, with clean instruments and thoroughly washed hands. *The skin* is sponged with iodine tincture or 70% alcohol solution for disinfection or producing reflex action. For this purpose a sterile stick with cotton ball moistened in iodine is taken to sponge the skin. It is forbidden to insert a stick into a bottle with iodine. It is necessary to pour out a small amount of iodine tincture into a flat vessel to avoid pollution of the whole content of bottle with the flakes of cotton wool. It is not allowed to store iodine tincture for a long time in vessels with leaky caps, because in such keeping concentration of iodine can rise due to the evaporation of alcohol. Painting with the concentrated iodine tincture the gentle skin areas can cause burns.

In the treatment *of eyes*, solutions of various medications and ointments are applied. The purpose of application is a local action. It is

necessary to select carefully a dose of a medical agent as the conjunctiva absorbs medication very well. Dropping drugs into an eye is made by a dropper. For this purpose it is necessary to draw a lower eyelid, put a drop on the mucous membrane closer to an external corner of the eye so that the solution is distributed on the conjunctiva by regular intervals. Eye ointment is put by a special glass stick between a mucous membrane conjunctiva and an eye globe at an external corner of the eye.

For *the nose* (intranasal) such drugs as powders, vapours (amyl nitrite, vapours of ammonia alcohol), solutions and ointments are applied. They produce local, resorbative and reflex effects. Absorption through the mucous membrane of the nose occurs very quickly. Powders are got into the nose by means of inhaled air current; with one nostril closed, a powder is inhaled through another. Drops are administered by a dropper; a patient's head is tilted back. Ointment is inserted by a glass stick. Greasing is made by a doctor with a cotton tampon on a probe. After greasing a tampon is thrown out, and a probe sterilized in a disinfectant solution. Special sprays-dosifiers (dispensers) are also used for intranasal introductions. Medicinal substances in them are solutions or suspensions with addition of the substances raising viscosity to slow down evacuation of a medication from the nasal cavity.

Medications are dropped in *ears* by a dropper. Oil solutions of medicinal substances should be warmed up to a body temperature. At dropping into the right external auditory meatus a patient lies on the left side or turns his head to the left side and on the contrary - when dropping into the left external auditory meatus is being performed. After introduction of drug the external auditory meatus is closed with a cotton tampon.

Treating female genitals the medication is introduced *into the vagina* as *balls* made on the basis of cocoa oil, cotton *tampons* soaked in various liquids and oils, *powders, solutions* for greasing and syringing. Action of medications is mostly local as the absorption through the intact mucous membrane of the vagina is insignificant. *Syringing* is made with the help of Esmarch mug with special vagineous tip or a rubber pear; under a patient's pelvis a bedpan is put. Warm solutions of medications for syringing are used.

Enteral administration of medications

The medication is administered through the mouth (*per os*), through the rectum and under the tongue (*sub lingua*).

More often medications *are given through the mouth (per os)*. This simple way allows administering medications in different, unsterile forms.

There are some disadvantages of this way of administration:

1. Slow absorption of a medication into the systemic blood circulation (depending on stomach filling, quality of food, ability of a medication for absorption). Absorption through a stomach mucous membrane occurs slowly, only fat-soluble substances are soaked up only, the process of absorption occurs mainly in the intestines. But slow absorption of medicinal substance into blood flow is not always a disadvantage: for there are medicinal forms specially developed for prolonged absorption of substance in the systemic blood circulation after its one-time use.

2. Change or even destruction of medication by gastric and intestinal juices, due to the interaction with food substances (adsorption, dissolution, chemical reactions) and chemical transformations in the liver. But some medicinal substances initially are made as inactive substance which becomes working only after transformation in liver. For example, the well-known antihypertensive drug enalapril is actually a promedicine and, before effecting, it should be transformed in the liver to its active form, i.e. enalaprilat.

3. Impossibility to foresee the forming concentration of a medicine in blood and in tissues because of uncertain speed of absorption and the amount of soaked substance.

4. To reduce these negative effects, medications are administered before meal (except those irritating a mucous membrane of the stomach). Medications are produced in the form of capsules to protect from the influence of gastric juice. The preparation may be introduced into the duodenum by a probe.

Diseases of the gastro-intestinal tract and liver change greatly the speed and completeness of absorption. Medications in the form of

powders, tablets, pills, solutions, (water and alcohol), broths, extracts, mixtures (*mixes*) are used orally.

A nurse strews powder to a patient's root of the tongue and gives water to swallow it down. In the same way a patient takes *a tablet and a pill*. For children tablets and pills are dissolved in water and given as a suspension.

Solutions, water extracts and mixtures adults take by table-spoon (15 g), children by teaspoon (5 g) or a dessert-spoon (7,5 g). It is convenient to use a measuring-glass for this purpose. Liquid medications of unpleasant taste are swallowed down with water.

Alcohol tinctures and some solutions patients receive as drops. The necessary amount of drops is counted by means of a dropper or directly from a bottle if it is specially adapted for it. Before taking the drops are dissolved in a small amount of water and then swallowed down with water. For calculation it is necessary to know, that 1 g of water contains 20 drops, 1 g alcohol - 65 drops, 1 g of ether - 85 drops.

Administration of medications *per rectum* has the following advantages:

1. Fast absorption and a high accuracy of dosage.
2. The medications are not exposed to the influence of enzymes as they are not present in the rectum, and get through the inferior haemorrhoidal veins directly to the inferior vena cava passing by the liver.
3. This way enables to give a medication to a patient who can't take it *per os* because of vomiting, esophageal impassibility, and dysphagia [difficulty in swallowing] (including unconscious patients); to a mentally ill psychic patient refusing to accept medication; in delirious state, when administration of medications through the mouth is impossible and injection is difficult and dangerous. In these cases introduction of sedatives with medicinal enema (for example, chlorehydrate solution) allows to struggle successfully against excitation.

Absence of enzymes in the rectum causes both advantage and disadvantage of this way of introduction for the medications of albuminous, fatty and polysaccharide structures can not pass through the intestinal wall without participation of enzymes and their use is possible only with the purpose of local action.

For rectal introduction *suppositories and medicinal enemas* are used. 50-200 ml of medication solution is introduced into the rectum on the depth of 7-8 cm. Before this procedure cleaning enema is giving to a patient.

Suppositories may be of a factory production or they are rarely made on a fatty basis, formed in the lengthened cone and wrapped in a waxed paper. It is better to store them in a refrigerator. The pointed end of a suppository is released from a paper before introduction and is inserted into the rectum.

Application of a medication *under tongue* (sub lingua) is quickly soaked up, is not destroyed by the digestive enzymes and acts in the systemic blood circulation passing the liver by. However this way can be used only for the administration of medications used in small doses (such as nitroglycerine, validol, sexual hormones etc.). *Buccal* forms of medical agents are applied as plates and the tablets stuck on the mucous membrane of the upper gum. Buccal forms of nitroglycerine are considered to be some of the most prospective medicinal forms of nitroglycerine.

Introduction of medicine into the respiratory tract

Introduction of medication directly into the respiratory tract is used in various diseases of the respiratory ways and lungs. The medicinal substance is more often applied in the form of *aerosol* for *inhalations*, rarely the solution of a medication is poured into the trachea through a rubber tubule or through a tube of the special device – bronchoscope. It is possible to receive local, resorbative and reflex effects introducing medications in respiratory tract.

Treating the catharal inflammations of the upper respiratory tract and tonsillitis *steam inhalation* by means of the elementary inhaler is long used. The steam jet, formed in the warmed water tank, is thrown out by a horizontal tube of a spray and rarefies the air under the vertical knee owing to that the medicinal solution rises from a small glass on a vertical tube and the solution is divided into the smallest particles. Vapour with particles of a medicine gets into a glass tube which a patient takes into the mouth and breathes through it (making a breath through the mouth, and an exhalation through the nose) within 5-10

minutes. At home it is possible to use a teapot instead of an inhaler, in which a paper or a plastic tube is inserted; breath will be carried out through the mouth. In a teapot herbs and/or soda are put.

In the steam inhaler particles of medication are rather large and consequently they are precipitated on the mucous membrane of the upper respiratory tract without reaching the lungs. To get an aerosol with smaller particles (which can reach the alveoli), the inhalers with complex devices to spray are applied. For the formation of an aerosol the air or oxygen is used instead of vapour which is forced into a horizontal tube of the spray under different pressure, and on the vertical tube the medicine rises, for example the solution of penicillin which a patient inhales during a certain period of time until he gets the appointed dose.

Injections and infusions

Parenteral introduction of medications (avoiding the alimentary tract) is carried out by means of *injections* performed intracutaneously, subcutaneously, intramuscularly, intravenously, intraarterially, intraperitoneally, to pleural cavities, to heart, to the breast bone marrow (intrasternally), to the spinal channel, to some painful focus, and also by means of intravenous and intraarterial infusions.

1. Check the label on the medicine bottle to make sure that the right medicine is used. Check the expiration date on the bottle. Do not use expired medicine. Inspect medication for any discoloration. Do not use if it is discoloured.

2. Remove the cap from a medicine bottle, if it is a new one. Clean the top of the bottle every time with an alcohol pad. Do not touch the top of the bottle after it is cleaned with alcohol.

3. Attach and tighten the needle onto the syringe.

4. Take the needle cap off the needle and place it on the table.

5. Pull back the end of the plunger. Draw air into the syringe equal to the amount of medicine to be drawn up. Do not touch the plunger or the needle.

6. Insert the needle into a stopper on the top of the bottle.

7. Push down the plunger to push the air into the bottle. Leave the

syringe in the bottle.

8. Invert the bottle and syringe so the bottle is on the top and the syringe below. Be sure to support the syringe and the bottle so the needle is not bent.

9. Pull down the plunger allowing a medicine to fill in the syringe. Stop at the amount ordered.

10. Check for bubbles in the syringe. If air bubbles are present:

- tap the barrel of the syringe with your finger to move any bubbles to the top of the syringe,
- push the plunger slightly up to move any air bubbles out of the syringe,
- pull down the plunger again and fill the syringe with the correct amount of medicine,
- check again for air bubbles and if present, repeat the steps above.

11. Remove the needle from the bottle.

12. Carefully replace the needle cap.

Subcutaneous Injection

Choosing injection sites and rotation

This is the route of administration that is most commonly chosen for injection because it provides a greater comfort level. Alternate sites in order to prevent absorption problems, the risk of infection, or soreness, which may occur if one site is used repeatedly.

Gather supplies:

- alcohol swab,
- needle and syringe for subcutaneous injection,
- bandage strip,
- gauze pad,
- medication,
- sharps container.

A nurse should:

1. Wash her hands.
2. Prepare the injection site by cleaning the area with an alcohol swab. To start in the center, apply pressure, and cleanse in a circular motion working outward. Do not retrace your steps.

3. Wait a few seconds until the alcohol dries. This reduces the

sting. Remove a needle guard from a needle and syringe filled with medication. Hold the syringe as you would a pencil.

4. Pinch up the skin gently at the injection site with a free hand. Holding the syringe at a right angle (30°) to the site, insert the needle using a quick smooth motion. Going slowly will cause more pain.

5. When a needle is in place, pull slowly back on the plunger in order to see if any blood flows into the syringe. If some blood enters the syringe (a rare occurrence) remove the needle, discard the syringe and medication, and prepare another injection.

6. If no blood enters the syringe, inject the medication slowly by soft pushing the plunger until the syringe is empty (Fig. 11).

7. Remove the needle quickly. Apply pressure to the injection site with a dry, sterile gauze pad. You may note a drop of blood, but there is no cause for concern. If it's necessary, apply a bandage. Without replacing the needle guard on the needle, dispose of the needle into a sharps container.

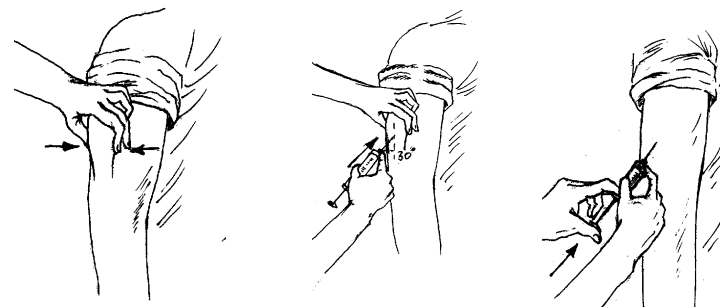


Fig. 11. Subcutaneous injection.

Intracutaneous injections

Intracutaneous injections are basically applied with diagnostic purpose (allergic Mantoux's, Burne's tests, etc.) and *for the local anaesthesia*. The amount of the introduced liquid is 0,1-1,0 ml. For the diagnostic test an internal surface of the forearm is used.

Intramuscular Injection

Choosing injection sites (Fig. 12) and rotation

It is necessary to use a number of injection sites on a rotating basis

and to alternate among sites in order to avoid absorption problems, the risk of infection, or soreness, which may occur if one site is used repeatedly.



Fig. 12. Places for intramuscular injections into the gluteal area (shaded).

Recognizing possible problems

Check the following signs:

- a persistent lump or bruise at injection site,
- sign of infection at injection site (pus, redness, pain, or heat),
- numbness or weakness in legs/feet after an injection into thigh or buttocks.

Gather supplies:

- alcohol swab,
- needle and intramuscular syringe,
- bandage strip,
- gauze pad,
- medication.

A nurse should:

1. Wash her hands.
2. Prepare the injection site by cleaning the area with an alcohol swab. To start in the center, apply pressure, and cleanse in a circular motion working outward. Do not retrace your steps.
3. Wait a few seconds until the alcohol dries. This reduces the sting. Remove a needle guard from a needle and syringe filled with medication. Hold the syringe as you would a pencil.
4. Stretch a patient's skin by 2 fingers of the left hand in the place of the injection. Holding the syringe at a right angle (90°) to the site, insert the needle using a quick smooth motion (Fig. 13). But if a patient is lean pinch up the skin gently at the injection site with a free hand. Going slowly will cause more pain.

5. When a needle is in place, pull slowly back on the plunger in order to see if any blood flows into the syringe. If some blood enters the syringe (rare occurrence) remove the needle, discard the syringe and medication, and prepare another injection.

6. If no blood enters the syringe, inject the medication slowly by soft pushing the plunger until the syringe is empty.

7. Remove the needle quickly. Apply pressure to the injection site with a dry, sterile gauze pad. You may note a drop of blood, but there is no cause for concern. If it's necessary, apply a bandage. Without replacing the needle guard on the needle, dispose of the needle into a sharps container.

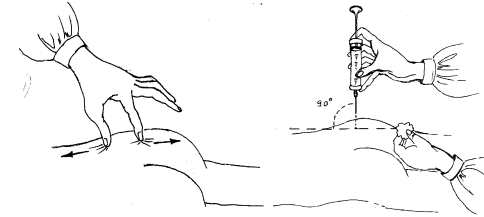


Fig. 13. Intramuscular injection.

Intravenous injections and infusions

Vein puncture is made for intravenous injections of medicine and taking blood for analysis, and also bloodletting (extraction of 200-400 ml of blood if needed).

Intravenous Injection

1. To wash your hands.
2. To gather supplies.
3. To put on gloves.
4. To position a patient so that the vein is easily accessible and you are able to perform the venipuncture in a comfortable position. Always have a patient either lying in bed or sitting in a chair with the arm propped up.
6. To explain the procedure to the patient.
7. To apply the tourniquet around the arm approximately 10 cm above the cubital fossa with enough tension so that the VEIN but not the ARTERY is compressed.

8. To position the patient's arm extended with little or no flexion at the elbow.
9. To locate a prominent vein by palpation. If the vein is difficult to find, it may be made more prominent by massaging the arm with an upward motion to force blood into the vein.
10. To cleanse the puncture site with a 70% alcohol pad or iodine solution and allow to dry (a patient sometimes squeezes and unclenches his fist for improvement of vein filling).
11. To choose the vein which is mostly convenient for the puncture, then by tips of fingers of the left hand displace a little the skin above it aside towards the forearm, fixing the vein.
12. To take the needle prepared for a puncture or a syringe to the right hand.
13. To puncture the skin above the vein and the walls of the vein itself or to do a puncture in two stages, i.e. first to puncture the skin and then bring the needle closer to the vein wall and puncture a vein itself.
14. To be convinced, that a needle is in vein, it is necessary to pull the syringe plunger on itself slightly - in the cylinder of a syringe blood should appear.
15. Having blood in a syringe to untie the tourniquet by the left hand pulling for one of the free ends of the tourniquet, and also to ask a patient to unclench his fist.
16. Not changing the position of a syringe, by the second and third fingers of the right hand holding the cylinder, the thumb of the left hand presses on the plunger, entering a medicine not up to the end, leaving air bubbles in a syringe.
17. To put by the left hand cotton ball with alcohol to a place of puncture, and by the right hand take a needle from a vein.
18. A patient's arm is bent in an elbow joint for some minutes up to a complete stop of blood.
19. To register date, time, reason for infusion, and number of units infused in the infusion record.

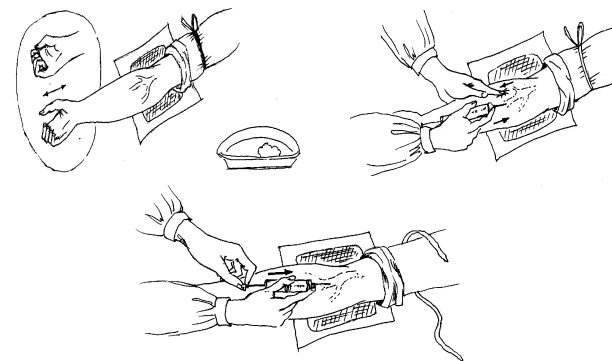


Fig. 14. Intravenous injection.

Intravenous infusions

Intravenous infusions are applied to insert the greater volume of transfused substances. They are carried out for restoration of volume of circulating blood, disintoxication of an organism, normalization of metabolism, for maintenance of vital activity of an organism. Preparation (refuelling) of system for drop infusions will be done in the procedure room, and infusion - in ward, thus the patient should be in convenient (horizontal) position.

Sterile system for intravenous drop infusion (Fig. 15):

- 1) a dropper with two tubes departing from it - a long tube with a dropper and a clip for regulation of speed of a liquid introduction (there is a grid in a dropper - filter for the prevention of hit of large particles in blood circulation) and shorter one;
- 2) needles on both ends of the tube: one (on shorter end of system) for piercing a cap of bottle with the solution, the second - for puncture;
- 3) an air line (a short needle with the short tubule closed by the filter).

In reusable systems used before for intravenous infusions the role of an air line was carried out with a long needle which was placed in a bottle so that the end of a needle was in a bottle above a liquid level.

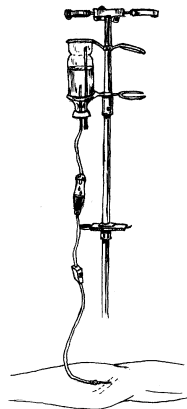


Fig. 15. The system for intravenous drop infusion.

Preparation of system for intravenous infusion

1. To wash your hands carefully with warm water and soap, rinse them with alcohol.
2. To rinse a metal cover of a bottle with the sterile cotton ball moistened in alcohol, and remove it with sterile tweezers. To rinse a rubber cap with the sterile cotton ball moistened in alcohol.
3. To unpack the system.
4. To insert a needle of an air line into a cap of the bottle, the free end of a short tubule of an air line to arrange along a bottle so that its end is up to standard of a bottom of a bottle and to fix a chemist's elastic band or a medical plaster.
5. To insert a punction needle into a bottle. Then turn and fix a bottle on a special stand.
6. To turn a dropper in horizontal position (in parallel to a floor), to open a clip and to fill slowly in a dropper up to half of volume.
7. To close a clip and return a dropper in a starting position. Thus the filter of a dropper should be completely closed by a liquid for transfusion.
8. To fill the solution in the whole system, open a clip and fill in slowly all system before full replacement of air in a tubule and appearances of drops from a needle for injection, close a clip.
9. To move out the air bubbles in the system, take above the

turned bottle the end of a tube with canule for a needle, slightly tapping on a wall of a tube while bubbles will not be separated from a wall and will not leave through an external aperture of a tube.

10. To prepare a sterile tray, putting the cotton balls moistened in alcohol and a sterile napkin in it. To prepare 2-3 strips of a narrow adhesive plaster in length of 4-5 cm (for fixing a tube and a needle to a patient's arm).

SITUATIONAL TASKS

1. Before preparation of a syringe a nurse has made the following actions:

- washed thoroughly hands with soap under warm running water;
- wiped hands with cotton tampon moistened in 70% alcohol solution;
- put hair under a medical cap;
- put on sterile gloves.

Specify a mistake in nurse's actions.

The correct answer: a nurse should not touch with the washed hands non-relevant objects.

2. A doctor prescribed intramuscular sedative injection. A nurse at doing injection has inserted a needle on the depth of 8 cm at an acute angle to a skin surface in the upper-lateral quadrant of buttocks, pressing down by the left hand skin around a place of puncture.

Estimate correctness of nurse's actions.

The correct answer: the puncture should be made perpendicularly to skin surface.

3. A ward nurse had read in the register of assignments the following record: "ciprofloxacinum by 2 tablets twice a day" and made the following actions:

- took a packing of an antibiotic from a drawer;
- checked up correctness of the medication's name prescribed by a doctor;
- washed thoroughly hands with soap in warm running water;
- opened a package with medication in a ward;
- put 4 tablets on a bedside-table near a patient's bed;
- explained to a patient, that he should take 2 tablets in the

morning and in the evening after meal with a half glass of water.

Do you agree with her actions?

The correct answer: She should ask a doctor, what dose he had in view of, appointing ciprofloxacinum “2 tablets twice a day” as tablets are in doses 0,25 and 0,5; besides a nurse herself should put a medicine into a patient’s mouth and give him a 200 ml glass of boiled water.

4. *During giving medical microenemas after solution introduction into a rectum, a patient told a nurse about his want for defecation.*

What omission took place in the work of a ward nurse, in your opinion?

The correct answer: it was necessary to give cleaning enema before giving medical enema to a patient.

CONTROL QUESTIONS

1. How to apply medications on skin?
2. How to insert medications into eyes?
3. How are medications introduced into ears?
4. How are medications put into the nose?
5. What advantages and disadvantages are characteristic of oral administration?
6. How is medicine administered into respiratory ways?
7. In what cases is a rectal way of administration used?
8. In what cases is it necessary to use injections?
9. What methods are used for sterilization syringes and needles?
10. What places are chosen for subcutaneous injections more often?
11. What places are chosen for intramuscular injections more often?
12. What are the indications for intravenous infusions?
13. Explain the role of air tubes in systems for intravenous infusions.
14. What complications can arise in breaking the rules of antiseptics and aseptics in injections?
15. What the rules of storage and taking medicinal substances do you know?
16. How frequently is it necessary to carry out disinfection of

rooms and furniture?

17. Speak about measures of the prevention of occupational diseases in the medical staff working with internal fluids.

UNIT 5

Theme 2. NURSING THE PATIENTS WITH RESPIRATORY DISEASES

Goals of the class: to get a notion about the main pathological symptoms and methods of the first premedical aid in the respiratory diseases; to master skills.

Objective of the class:

- *to know* the basis of human physiology of the respiratory system, the main symptoms of respiratory diseases and pathogenesis of their origin, rules of sputum collection, care peculiarities of patients with respiratory diseases, rules of pleurocentesis performance;

- *to master* the methods of observation of respiration, oxygenotherapy and safety measures working with oxygen, first premedical aid for patients with the symptoms of respiratory diseases.

The subject-matter of the class:

1) human physiology of the respiratory system, types of breathing in the norm;

2) the main symptoms of the respiratory diseases and the fundamentals of the general care of patients in their development.

Equipment required: tables, stopwatches, oxygen pillows, nasal catheters, spittoons with a lid, Petri dishes, ice bags, gauze napkins, 10 ml - syringes with thick pleurocentesis needle, pocket inhaler, test tubes. Place: a study room, a ward, an intensive care ward.

EDUCATIONAL MATERIAL

The respiratory diseases are met more often nowadays. The main function of the respiratory organs is gas exchange. Besides, respiratory organs participate in metabolism, acid-base equilibrium, defence reactions, blood circulation, thermoregulation and sound production. Correct care of patients with respiratory impairment is a guarantee both

of successful treatment of the respiratory diseases and the normal functioning of a human organism on the whole.

Respiration is a process of oxygen getting into the body and carbon dioxide and water steam withdrawal. Respiration is regulated by a respiratory centre, which is located in medulla oblongata. A direct irritant of the respiratory centre is an elevated level of carbonic acid and acid valences in blood as a whole.

Process of gas exchange consists of external and internal (tissue) respiration. External breathing is a gas exchange between atmospheric and pulmonary air and between pulmonary air and blood. Basically gas exchange takes place in the alveoli. Gas exchange is insignificantly (1-2%) performed through skin and digestive tract.

Pulmonary ventilation is realized due to inhalation and exhalation – movements of the chest.

A number of respiratory movements in a healthy man varies from 16 to 20 per minute. Respiration rate depends on age, sex and body position. Accelerated respiration occurs on physical exertion, nervous excitement, body temperature rise. Breathing slows down in sleep and in horizontal position.

Counting of respiratory movements is performed invisibly to a patient. For this purpose a patient's hand is taken (as if to feel pulse rate) and placed to a patient's chest, but in reality it is done to count thoracic respiratory motions. Normally respiration is rhythmical and of medium depth.

There are three distinctive physiological types of breathing:

1. Thoracic type – breathing is basically realized by means of intercostal muscles contraction. During inhalation the thorax widens. It is basically met in women.

2. Abdominal type - respiratory motions are basically performed with the help of diaphragm. During inhalation the abdominal wall is displaced. It's more often met among men.

3. Mixed type – it's more often met in elderly people.

*The main symptoms of the respiratory diseases
and general care of such patients at their development. Shortness
of breath (dyspnea)*

Dyspnea is a disorder of the frequency, rhythm and depth of respiration. A patient, as a rule, feels lack of air. Dyspnea can be

physiological and pathological. Dyspnea can be of pulmonary, cardiac, hematogenic, neurogenic and psychogenic origin.

There are the following distinctive types of dyspnea:

a) according to the rate:

- tachypnea – accelerated breathing (over 20 respiratory movements per minute);

- bradypnea – slow breathing (less than 16 respiratory movements per minute);

b) according to the phase of breathing:

- inspiratory – inhalation is laboured;

- expiratory – exhalation is laboured;

- mixed – both breathing phases are laboured;

c) according to disorders of respiratory rhythm:

- Cheyne-Stokes's respiration

Characteristic feature is periodicity of respiratory movements, between them there are intervals. A gradual growth of the respiratory movement depth takes place, its maximum is reached within 5-7 inhalations and is followed by the extinction. It is completed with a next short interval. During an interval a patient may be disoriented or even lose consciousness. An interval can last from several seconds to a minute. It is observed in heavy heart failure, drug poisoning, cerebral circulation disturbance, in coma. It can be observed "in the norm" as well – sometimes at an early children's age and in adults in their sleep.

- Biot's respiration

Uniform rhythmic deep respiratory motions alternate through approximately equal spans with prolonged respiratory intervals. An interval may last from several seconds to half a minute.

- Grokko's respiration

Reminds Cheyne-Stokes's respiration, but instead of an interval a weak superficial breathing with the following increase of depth is noted.

- Kussmaul respiration

A deep infrequent respiration. It's accompanied by a loud murmur. It is observed in deep diabetic coma.

Asphyxia (asthma)

Asthma is a strongly marked dyspnea attack. Depending on the origin, asthma may be bronchial (due to a bronchial spasm) and cardiac (due to congestion in the pulmonary circulation).

In dyspnea or hard breathing (asphyxia) a nurse must immediately report her observations to a physician as to dyspnea character, respiration rate and take measures to relieve patient's condition:

- to give a patient an elevated (semi-sedentary) posture,
- to get a patient free from tight clothes and heavy blankets,
- to increase fresh air flow into a ward
- to give a patient a pocket inhaler and instruct to use it in case of doctor's prescription,
- to perform oxygenotherapy in a case of necessity.

Oxygenotherapy

Oxygenotherapy is the use of oxygen in medicine.

Indications: acute or chronic respiratory insufficiency (cardiac insufficiency as well), accompanied by cyanosis, tachycardia (palpitation), decrease of oxygen partial pressure in tissues.

The oxygen mixture, containing 50-60% (up to 80%) of oxygen is used for the treatment (pure oxygen can produce a toxic effect on the human body, depress the respiratory centre). Carbogen (the mixture, containing 95% of oxygen and 5% of carbon dioxide) is used in carbon monoxides poisoning. In pulmonary edema, characterized by considerable foamy expectoration, oxygen mixture is bubbled through anti-foaming agents (50-96% solution of ethyl alcohol or 10% alcoholic solution of antifomsilanum silicone compound).

There are the following methods of oxygen supply:

1. Oxygen pillow. It is more frequently used under home conditions, when a patient inhales oxygen through a tube or a mouthpiece.

2. Nasal catheter. It is used in medical institutions with the use of compressed oxygen cylinders or centralized supply of oxygen to wards. Catheters are inserted into nasal passages on the depth, equal to the distance between a wing nostril and an ear lobule.

3. A mask. A mask applied to the face covers a mouth and a nose, it has inspiratory and expiratory channels. The inspiratory channel tubus is connected with thin rubber respiratory bag, in which oxygen is accumulated during exhalation, and it is actively sucked in by the lungs

during inspiration. One should remember that oxygen must be moistened (by running through water in the Bobrov's apparatus).

4. Hyperbaric oxygenation is a treatment with oxygen in high pressure in a special altitude chamber.

Cough

Cough is a complex reflex action, caused by the respiratory tract and pleura receptors' irritation and in most cases aimed at the removal of some foreign bodies, mucus, sputum, and blood from the respiratory tract in different lung and upper respiratory tracts diseases. Coughing push consists of sudden and sharp expiration in the closed true glottis. During the following sudden opening of the true glottis the air together with sputum and other foreign bodies is forcefully thrown out through the mouth.

The main reasons of cough development are respiratory inflammatory diseases (laryngitis, tracheitis, bronchitis, bronchial asthma, pneumonia, etc.), immune reactions caused by the allergen getting into a human body (pollen plant, dust tick, etc.), cardiovascular diseases with congestion in pulmonary circulation (heart diseases, ischemic heart disease, dilatational cardiomyopathy, etc.), mechanical irritation (pneumoconiosis¹, bronchial permeability disorder caused by compressive swelling, foreign bodies, etc.), chemical irritation (tobacco smoke, air pollution, fighting poisoning substances, domestic gas, etc.), thermal irritation (inhalation of very hot or very cold air), iatrogenic factors (drug side effects, e.g. from the group of angiotensin-transforming enzyme (ATE) inhibitors having various intensity in various ATE inhibitors²), reflex factors (irritation of pleura, pericardium, etc.), psychogenic factors.

By its characteristic features cough can be dry (without expectoration) and productive (with expectoration).

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¹ Pneumoconiosis refers to a group of occupational pulmonary diseases, caused by a prolonged inhalation of industrial dust

² Cough appears in 15% of patients with arterial hypertension and chronic heart failure receiving enalapril -ATE inhibitor of II generation with an acetyl group in its molecule. And it appears only in 2-3% of patients, receiving monopril - an ATE inhibitor of III generation containing a phosphinil group.

Sputum is a pathological secretion of the lungs and upper respiratory tracts, which is usually expectorated in coughing. The amount and character of sputum has an important diagnostic significance. By its character sputum can be crudum, serous, pyogenic, hemorrhagic and mixed. Its diurnal amount may change from 10-15 ml in chronic bronchitis to 1 liter and more in case of lung abscess burst into bronchi, lung gangrene or in bronchiectatic disease.

To prevent people's contamination with sputum microorganisms, a nurse must teach a patient to behave properly in people's surrounding:

- a patient must not cough near people,
- a patient must close his mouth with a hand or a handkerchief in coughing,
- a patient must not spit his sputum on the floor, for while drying it may form dust particles and infect other people,
- a patient must collect his sputum into a special spittoon with a tight lid, and a small amount of 0.5% solution of chloramines is poured to its bottom.

Spittoons are daily cleansed after preliminary registering of the diurnal sputum amount on the temperature chart. Tuberculous patient's sputum is burnt down or poured out into sewerage after preliminary disinfection (to cover sputum with 20 g of dry lime chloride per a l of sputum for 2 hours).

Care of a patient with dry cough supposes the main disease treatment, use of the expectorants, warm alkaline drinking is recommended as well. In the presence of sputum, a nurse must look after timely cleansing of pocket spittoons, disinfect them daily with chloramine solution, clarified with a lime chloride solution. It is necessary to watch a patient to take a regular drainage posture (a posture, when sputum is better discharged) for 30 minutes several times a day.

Hemoptysis

Hemoptysis is an expectoration of blood or sputum with bloody admixtures from respiratory tracts in coughing. In croupous pneumonia the sputum may be rusty. Significant blood discharge through the

respiratory tracts (with cough or continuous stream) is called pulmonary hemorrhage. It is necessary to differentiate it from gastric hemorrhage. In pulmonary bleeding blood is scarlet, foamy, incoagulable, it has alkaline reaction and is discharged in coughing, whereas in gastric bleeding blood is as a rule dark, of "coffee grounds" type (due to the interaction between hydrochloric acid and gastric juice and hydrochloride hematin formation), it has acid reaction, is mixed with food and is discharged in vomiting. Hemoptysis and pulmonary hemorrhage are very serious symptoms and need urgent medical approach both in diagnosis (diagnostic roentgenoscopy, tomography, bronchoscopy etc.) and treatment.

Care of such patients assumes a complete rest, a semi-sedentary posture with an inclination to an injured side to prevent blood penetration into a healthy lung. An ice bag is put on the sore part of the chest. A piece of ice given to swallow causes a reflex vascular spasm and decreases pulmonary blood filling. Antitussive medication is administered in severe cough intensifying bleeding. Food is only given in a cold, watery state. Cups, mustard-plasters, hot-water bottles, hot compresses on the thorax are contraindicated (!).

Thoracic pains

In respiratory diseases an algescic syndrome is more often connected with pleural involvement into a pathological process (pleuritis, pleuropneumonia, carcinomatosis of pleura, etc.). Pleural pains are provoked by respiratory motions; therefore patients try to breathe superficially.

Care of the patients with pleural pains is supposed to give a patient a comfortable position, restricting respiratory motions (i.e. on a sore side), to apply mustard-plasters, to draw an iodine net in a diseased area, to use analgetics (according to doctor's prescription).

PRACTICAL SKILLS

Sputum collection for the total analysis

Aim: macro-and microscopic research of the sputum.

Equipment: a clean dry spittoon or a pot with a lid.

1. Morning sputum should be taken for examination.
2. A nurse should inform a patient about the time and technique of analysis passing, give him a clean, dry, marked spittoon on the eve of the procedure.
3. In the morning a patient should thoroughly clean his teeth and rinse his mouth.
4. A patient expectorates sputum (5 ml is enough) without touching the edges, covers a spittoon tightly with a lid and puts it into a cool place.
5. A nurse should write out a direction and deliver sputum to a laboratory.

Sputum collection for microbiological examination

Aim: microflora examination and determination of antibiotic sensitivity.

Equipment: sterile Petri dish with culture medium.

1. A patient cleans teeth.
2. A nurse should write out a direction to a laboratory beforehand.
3. A nurse puts on an additional dressing gown, a mask, a cap, glasses (especially in suspected or diagnosed HIV¹-Infection).
4. A patient makes 5-6 coughs to a vertically situated Petri's dish with a culture medium at a distance of 5-10 sm.
5. A nurse covers a Petri's dish with a lid and provides its fast delivery to a laboratory together with a direction.

Sputum collection for tuberculosis bacilli

Aim: diagnosis of pulmonary tuberculosis. Flotation method (sedimentation) is used.

Equipment: a clean dry spittoon or a pot with a lid.

1. A patient collects sputum into one container for 3 days.
2. A container (spittoon) should be kept in a cool place.
3. In 3 days a nurse delivers a spittoon to a laboratory.
4. After examination sputum is burnt down in muffle furnaces.

Sputum collection for atypical cells

Aim: diagnosis of pulmonary and bronchial tumour diseases.

Equipment: a sterile dry spittoon.

1. Fresh morning sputum is taken for examination.
2. A nurse should inform a patient about the time and technique of sputum collection for the analysis on the eve, in the morning she gives him a sterile, dry, marked spittoon.
3. In the morning a patient cleans his teeth.
4. A patient expectorates sputum (5 ml is enough), not touching spittoon edges.
5. A patient tightly covers a spittoon with a lid and puts it into a cool place.
6. A nurse writes out a direction and promptly delivers sputum to a laboratory, as tumour cells are quickly destroyed.

Giving a patient a drainage position

Aim: to provide better expectoration in bronchitis, pulmonary abscess, bronchiectatic disease, etc.

1. From a position on his back a nurse gradually turns a patient around his axis to 360°; thus, turning a patient to every 45°, a nurse makes a patient to perform deep exhalations and in cough induces him to expectorate better.

2. It is possible to use a pose of “a praying Muslim”, when a patient kneels down and bents forward (6-8 inclinations, 1 minute interval, then 6-8 inclinations again, but no more 6 cycles at a time).

3. Another drainage position is a pose of “slippers’ searching under a bed”, i.e. lowering a patient's head and a body upper part from a bed (to the right and to the left in turn).

These procedures are carried out 5-6 times a day. It's no use to perform these positions if there is no expectoration in anyone of them!

Oxygenotherapy

Aim: oxygen saturation of the body in acute or chronic pulmonary and heart failure, carbon monoxide poisoning.

Equipment: an oxygen pillow (a 10-25 l rubberized bag with a rubber tube, a tap (valve) and a mouthpiece), sterile nasal catheters, vaseline, 70% ethyl alcohol solution, a tray, plaster, a rubber or plastic

¹ HIV – Human Immunodeficiency Virus

tube.

It is necessary to be convinced in respiratory tracts permeability before oxygen use!

In the use of oxygen from an oxygen pillow:

1. To fill an oxygen pillow from a cylinder, opening a reducer and a pillow valve (it is necessary to stand aside to escape an eye injury from a casual oxygen spray).

2. To process a pillow mouthpiece with a sterile gauze napkin, soaked in 70% ethyl alcohol solution.

3. To wrap up a mouthpiece with 2-3 gauze layers soaked in water, to moisten oxygen.

4. To set a funnel against a patient's mouth or to insert a mouthpiece into a mouth, then open a valve on a rubber tube of an oxygen pillow.

5. To regulate the oxygen income rate by pressing a pillow with a hand.

In the use of oxygen through nasal catheters:

1. To vaseline a sterile nasal catheter (No 8-12).

2. To insert a catheter through a nose along an inferior nasal passage till pharyngeal back wall to the depth equal to the distance between a nose tip and an ear lobule.

3. If a patient is conscious, to offer him to open a mouth and visually check catheter introduction into the rhinopharynx. During correct introduction a catheter's end should be seen in the fauces.

4. To connect a catheter external part with a rubber or plastic tube joined to the centralized system of oxygen supply to the wards; to fix it to a cheek with an adhesive plaster.

5. To moisten the oxygen it is passed through a liquid, poured into the so-called Bobrov's apparatus, thus to connect a rubber tube, joined to a catheter, with a short glass tube of the Bobrov's apparatus; to connect a rubber tube from the centralized system of oxygen supply to the wards with the apparatus long tube.

6. To open a valve of a cylinder dosimeter (it is located in a ward).

7. To change a catheter position every 30-60 minutes in order to prevent nasal decubitus and drying of nasal passages mucosa.

It should be kept in mind that compressed oxygen coming into

contact with oil, fat, and petroleum actively interacts with them, causing ignition and explosion. Therefore it is prohibited to keep near oxygen cylinders oiled rags, clothes, any things soiled with fresh paint. It is necessary to prohibit smoking in a place where an oxygen cylinder is kept, as well as placing it near fire, sources of heat and light. Oxygen is kept in cylinders under 150 atm. Oxygen cylinder is always painted dark blue.

Pocket inhaler use

Aim: introduction of a medicinal substance into a human body in aerosol form.

Equipment: cylinder with aerosol.

1. To take off a cowl from a cylinder and turn a cylinder upside down.

2. To shake a cylinder.

3. To ask a patient to make a deep exhalation.

4. To suggest a patient to clasp a mouthpiece with lips, to make a deep inspiration, to press simultaneously a cylinder bottom (a dose of aerosol is given off at this moment) and to ask him to hold his breath for a few seconds.

5. Then a patient should take a mouthpiece out of his mouth and do a slow exhalation.

6. If it's impossible to make a deep inhalation, then the first dose of aerosol can be sprayed in the oral cavity.

7. The amount of consumed aerosol doses is determined by the doctor (!).

Pleurocentesis (thoracocentesis)

Puncture of the pleural cavity for liquid extraction is called pleurocentesis. Pleurocentesis is carried out by a doctor, a nurse helps him.

Aim: evacuation of liquid accumulated in the pleural cavity, determination of its character (inflammatory or non-inflammatory exudation) for diagnosis specification, as well as drug introduction into the pleural cavity.

Equipment: a 20-ml syringe, Dufo's needle, a rubber tube with a cannula, Mor's clamp, a sterile tray, an electrodrainer, 5% iodine solution, 70% ethyl alcohol solution, a sterile bandage, sterile test tubes,

0,25% novocain solution, a pillow, an oilcloth, a chair.

1. To sit a patient on a chair facing a chair backrest with arms crossed on a chest or on a pillow, placed on a chair backrest.

2. To incline a patient opposite to a side, where a puncture will be carried out.

3. To replace a patient's hand from a puncture side to a healthy shoulder.

4. Puncture is performed by a doctor along a posterior axillary line in a zone of maximal dullness of a percussion sound - usually in the VII-VIII intercostal space.

5. A place of puncture is first treated with an iodine alcohol solution, then with 70% ethyl alcohol solution and again with iodine.

6. A doctor performs a local anaesthesia with 0,25% novocaine solution (a nurse hands a syringe with novocain solution to a doctor).

7. With an aspiration needle with a rubber tube, compressed with Mor's clamp, a doctor pierces the intercostals space in the upper edge of a underlying rib as a neurovascular fascicle passes along a lower edge of a rib.

8. When a needle enters a pleural cavity there appears a sense of "downfall" into a free space.

9. A 10-20 ml syringe is used for a trial puncture, while for the evacuation of a large amount of liquid electrodrainer is used (a nurse gives a syringe, turns on an electrodrainer).

10. After a puncture a rubber tube is connected with a syringe, a clamp is taken off and pleural cavity content is being sucked out – a full syringe is collected, a tube is tightened by a clamp.

11. The syringe content is poured out into test tubes preliminarily signed and sent to a laboratory for physical and chemical, cytological or bacteriological examination.

12. A rubber tube is connected with an electrodrainer, Mor's clamp is taken off and up to 1200-1500 ml is sucked out singularly (withdrawal of a large amount of liquid as well as fast withdrawal, can lead to fast shift of mediastinum organs to a sore side and to collapse).

13. After a needle removal a puncture place is sponged with a 5% iodine solution and a sterile bandage is applied.

14. It is desirable to transport a patient on a wheelchair into a ward.

15. After the puncture a patient should be under doctor's and nurse's observation for a day.

SITUATIONAL TASKS

1. A physician prescribed a patient K. a total analysis of sputum, for that purpose he was given a clean marked spittoon in the evening. A patient collected his sputum in the evening, at night and in the morning, and a spittoon was delivered to a laboratory by a nurse.

Assess correctness of a nurse's actions.

Answer: A nurse had to inform a patient about the time and technique of passing the total analysis of sputum: a patient had to deliver fresh morning sputum after the treatment of mouth cavity (to clean the teeth and to gargle a throat).

2. A patient with tuberculosis collected sputum into a special spittoon during the day. After the daily cleaning of the spittoons a nurse poured off the contents straight away into a sewerage.

Is there a mistake in the action of a nurse?

Answer: pouring off the contents of a spittoon into sewerage must be performed only after preliminary decontamination of contents of a spittoon for a period of 2 hours by means of adding dry lime chloride (20 g per 1 liter of sputum).

3. A patient B. was admitted to a casualty ward complaining of pronounced pains in the left thoracic area and sputum discharge with traces of blood. A nurse rendered the following first aid: she laid a patient on his left side and applied a hot-water bottle to the right side, and then she called a physician.

Point out, what actions of a nurse were wrong.

Answer: a patient had to be given a semi-sedentary posture with bending to an injured side (in this case to the right one), and instead of hot-water bottle a nurse had to apply an ice bag to an injured thoracic area.

CONTROL QUESTIONS and THEMES FOR DISCUSSION

1. Describe physiological types of breathing.
2. What is dyspnea and what are its types?

3. What is asthma and what are its types?
4. What's the first aid in dyspnea and asthma?
5. What are the rules of sputum collection for a total analysis?
6. What are the rules of sputum collection for a microbiological analysis and the presence of tubercle bacilli in it?
7. Methods and principles in oxygenotherapy performance.
8. Rules of patient's posture in drainage.
9. Aim and methods in the pleural puncture performance, the role of a nurse.
10. The first aid in pulmonary bleeding.

GLOSSARY OF THE MAIN TERMS AND CONCEPTS

1. Pathogenesis - a) a mechanism of the disease development, pathological process or condition; b) doctrine concerning the general laws of development, clinical course and outcome of diseases.
2. An inhaler – a special apparatus in which steam or compressed air sucks in a drug and sprays it. In inhalers drug substances reach a necessary degree of pounding (the smaller the particles are, the deeper they penetrate into respiratory tracts). There are stationary and portable inhalers.
3. An aerosol – a suspension of extremely small liquid or solid particles (about 0,001 mm diameter) in the air. Drugs in aerosol form may be administered by inhalation.
4. Safety engineering – a system of measures providing healthy and safe working conditions.
5. Intensive care ward – a specialized ward. It is equipped with apparatus for constant observation under the functioning of vital organs and systems. The first aid is rendered here in severe disturbances of the organs and systems. Critical care is carried out in cessation of the work of vital organs and systems.
6. An ice bag – a rubberized bag filled with ice.

7. The Bobrov's apparatus¹ - in a given context it is a special device with water, through which oxygen is passed for humidification to prevent mucosal drying of the respiratory tracts.

8. An altitude chamber (Greek “baros” - gravity) – a hermetic chamber in which diminished (vacuum altitude chamber) or high (a compression altitude chamber) air pressure is created.

9. Medical cups – cups of a special form (pots with a rounded bottom and thickened edges), used to produce an effect on a human body in some diseases (respiratory inflammation, some neurological diseases) due to blood rush to the skin as well as by autohemotherapy mechanism.

10. Mustard plaster – a sheet of dense paper covered with a layer of defatted powder of mustard seeds. It renders an irritating anti-inflammatory and analgetic (diverting) effect.

11. A hot-water bottle - a medical device to improve blood filling of some body region. There are water (a rubberized bag filled with hot water with densely screwed lid) and electric (heated up by electricity) hot-water bottles.

12. A compress - a medical bandage made of gauze or cloths. There are dry and wet (cold, hot, warming) compresses.

13. An iodine net – skin sponging with iodine solution in lines.

14. A nasal catheter - a special tube for the nasal passages introduction with diagnostic or medical purpose.

15. A cylinder – container for gas storage and transportations.

16. An oxygen pillow – a 10-25 l rubberized bag with a rubber tube, a valve and a mouthpiece.

17. A valve - a device to regulate liquid or gas flow.

18. A mouthpiece – a part of various devices looking like a tubule or a point.

19. A cannula - a short tube with the a blunted end, used for the introduction of medicines or radiopaque substances into body cavities and canals, restoration of respiratory permeability, liquids evacuation from body cavities. They are made of metal, glass or plastic. Another

¹ Initially A.A.Bobrov's apparatus (1850-1904) was invented for hypodermic introduction of liquids.

use of a cannula: a dilated part of a needle is used for the connection with various devices.

20. Cyanosis- cyanotic skin and mucous membranes color in insufficient blood saturation with oxygen, blood flow delay, finally caused by the augmentation increase of reduced hemoglobin content in blood (over 5 g %).

21. An abscess - a limited pus accumulation in tissues or organs owing to their inflammation with tissues fusion and cavity formation.

22 A gangrene (Greek “gangraina” - a phagogenic ulcer) - a necrosis of tissues usually owing to a trauma or blood vessel occlusion with a subsequent infection. Pulmonary gangrene - a putrefactive lung degeneration with a fast purulent fusion and a pulmonary tissue rejection without a precise limitation from a viable part of a lung, caused by anaerobic bacteria.

23. A sputum of “a coffee grounds” type - a sputum is brown in colour.

24. A Petri dish - a special formed cup with a lid (with a round bottom about 10 centimetres in diameter and about two centimetres in height), intended for bacterial cultivation to determinate their species, antibiotic sensitivity and other special examinations.

25. Tomography (Greek “tomos” - a layer, a layer + graphia – layer-by-layer visualization of tissues). An X-ray tomography – radiological method of an object examination with obtaining an isolated shadowed picture of any object layer on a roentgenogram.

26. Oxygenotherapy – use of oxygen in the treatment.

27. A drainage position - a position when expectoration is better.

28. Atypical cells - tumoral cells.

29 Janet's syringe – a 100-150-ml syringe.

30. Collapse - a serious form of acute vascular failure.

UNIT 6 NURSING THE PATIENTS WITH CARDIOVASCULAR DISEASES

“Heart is a source of life, the beginning of all, the sun of a microcosm on which life depends, freshness and force of an organism.”

U. Garvey, 1628

Goal: to get a notion about the basic signs of cardiovascular diseases and methods of the first pre-medical help in their occurrence; common care of patients with cardiovascular diseases; to master skills.

Knowledge objectives:

- to know normal parameters of pulse and blood pressure and their values in pathology; basic signs of cardiovascular diseases and a pathogenesis of their development; characteristic features of the general care of patients with cardiovascular diseases; measures of the first pre-medical help in the major signs of cardiovascular diseases; diet peculiarities in cardiovascular diseases.

Skill objectives:

- to develop practical skills: taking the arterial pulse, blood pressure, estimating the water balance, assistance to a doctor performing transabdominal puncture.

Subject-matter:

- 1)arterial pulse, techniques of taking, its basic characteristics;
- 2)blood pressure, techniques of measuring. Concepts of arterial hypertension, hypertensive crisis, arterial hypotension;
- 3)the basic signs of cardiovascular diseases and the first pre-medical help in their appearance;
- 4)diet in cardiovascular diseases;
- 5)techniques of a transabdominal puncture (laparocentesis) and assistance to a doctor.

Equipment required: medical tonometer (sphygmomanometer), a stop watch, balance, temperature chart, graduated jar.

EDUCATIONAL MATERIAL

Cardiovascular diseases such as essential or arterial hypertension (AH)¹, coronary heart disease (CHD), heart failure (HF) are the most wide-spread and dangerous diseases now. So, AH is present nearly in each second adult person (J.N.Belenkov, 2002); lipid disorders underlying CHD, are found in 60% of Russian inhabitants in efficient age. Thus the amount of cardiovascular diseases annually grows for 4,7% with an annual accretion approximately in 1 million patients in Russia. Mortality in Russia by 2,5 times exceeds mortality in the developed countries and it is even called "supermortality", as out of 148 million inhabitants of Russia over 1 million people die annually (900 person for 100000 population), and according to official statistics the population of Russia can cut down by a half in 60 years. Almost 56% from this total mortality are due to cardiovascular mortality, and now the mortality from AH in the young age has dramatically increased. By the level of mortality from stroke, this basic complication of AH, Russia occupies the first place in the world. Thus, cardiovascular diseases threaten to the national safety of Russia.

The principal cause of such prevalence and such mortality from cardiovascular diseases is that despite the intensive researches of scientists and doctors in the whole world, the reason (etiology) of these diseases remains uncertain. AH abroad even has synonymic (and the most wide-spread) name in which uncertainty of its etiology is emphasized – *an essential* hypertension. Hippocrate said: «Sublata causatollitur morbus» - eliminating a cause, you remove disease. Apparently, this position is also just today. However despite the uncertainty of the causes, many risk factors are revealed along with some pathogenetic ways in the development of these diseases. It is possible and it is necessary to struggle against them actively. At the same time it is a great challenge to reveal them at an early stage when patients do not have any complaints and do not go to see a doctor.

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¹ By virtue of that an essential hypertension - heterogenous disease with rather clear clinical-pathogenetic variants, essentially differing at the initial stages by mechanisms of development, in literature instead of the term "essential hypertension" (EH) scientists frequently use «arterial hypertension» (AH). Actually these terms are synonyms (according to I.E.Chazova, 2004).

That's why an essential hypertension is also named "silent disease", and even "the silent and mysterious murderer" in the USA. "Silent" – as there are no complaints, and consequently patients do not go to see a doctor; "mysterious" – as the etiology is unknown; "murderer" – as quite suddenly there develop potentially lethal complications - a stroke and myocardial infarction.

That's why to search for more perfect methods of prophylaxis, diagnosis and treatment of cardiovascular diseases is an important task challenging medicine and society as a whole. Performance of dispensarisation of the population or screening, i.e. "sieving", inspections for detection of AH in various groups of the "organized" and "unorganized" population is very important.

Recently the spectrum of the research methods in cardiology has considerably increased – daily electrocardiography Holter monitoring, monitoring of blood pressure, echocardiography (EchoCG), stress-echocardiography, etc. However the comparatively simple, the so-called classical methods of examination, i.e. feeling the pulse, taking blood pressure are still of great value. They are rather informative due to the received valuable information concerning the condition of hemodynamics and a patient as a whole.

Taking blood pressure (BP) should be made at patient's visit for a medical help of any kind, irrespective of the reason of going to a doctor. Therefore for everyone, who measures BP, it is important to do this obligatory (see below). That is not always done in routine medical practice and consequently mistakes can be observed.

ARTERIAL PULSE, TECHNIQUES OF FEELING THE PULSE, ITS BASIC CHARACTERISTICS

“With acquirement of appropriate practice trained fingers can become the most sensitive instrument of pulse examinations... On the basis of this examination we receive the information of a triple sort: firstly, relative frequencies and rhythm of a cardiac performance; secondly, relative events, descending during contracting and release of heart; and thirdly, the character of blood pressure, streaming in the arteries... Trained fingers are capable to distinguish a great diversification of blood waves forms. Though pulse waves are held a

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very short time, sensitive fingers are capable and for this small time distinguish the features of its character.” (The Scottish doctor sir James MakKenzi “ Studying of a pulse”, 1902).

Arterial pulse is jerky (more often periodic) fluctuations ("impacts") of the arterial wall caused by change of its blood filling in a systole and diastole. For diagnostic purposes pulse is defined in various arteries:

1) in carotid arteries (on a frontal side of m. sternocleidomastoideus, approximately in the middle of its length); examination needs to be carried out cautiously and not simultaneously from both sides since a. carotis is a rich reflexogenic zone and there is a danger of acute reflex retardation of cardiac contraction frequency;

2) in temporal arteries;

3) in femoral arteries;

4) in subclavial arteries;

5) in humeral arteries;

6) in radial arteries, etc.

More often the pulse is defined in the *radial* artery as the latter is situated superficially and it is well palpated between a styloid process of a radial bone and a tendon of an internal radial muscle. Pulse on the right and the left arms can be unequal because of abnormalities of development, narrowing, a comparison from the outside of the corresponding radial, humeral or subclavial arteries. In such cases examination of pulse for an estimation of heart work is carried out on an arm where it is better palpated. Define the following properties of an arterial pulse:

1. The rhythm is estimated by the regularity of the pulse waves following one after another. If the intervals between them are equal, pulse is considered to be *regular* (rhythmical pulse) and if intervals are unequal – pulse is *considered to be irregular* (arrhythmic). In atrial fibrillation the frequency of cardiac contractions can exceed the number of pulse waves. In such cases *pulse deficit is registered*, which needs to be counted up.

2. Frequency is a number of pulse waves in one minute. Normally the pulse rate changes within the limits of 60-90 in one minute, but can change over a wide range depending on a sex, age, temperature of air and a body, level of physical exertion. In newborns pulse is more

rapid, at the age of 25-60 pulse remains rather stable. Pulse in women is more rapid than in men, sportsmen and trained people and also elder people have more rare pulse. Rapid pulse rate is seen in the vertical position, during the physical exertion, in fever. The pulse with frequency less than 60 in one minute is called *slow*, more than 90 in one minute - *rapid*; depending on the number of heart beats (NHB) the terms *bradycardia* and *tachycardia* are accordingly used.

3. Filling of a pulse is defined by the volume of blood held in the artery. It depends on the actual quantity (volume) of blood, which has been pushed out in aorta during systole. In good filling the pulse wave is high, well defined (pulse is *full*). In bad filling it is small, felt with difficulty (pulse is *empty*). Hardly detectable, weak pulse is called *threadlike*. If the nurse finds it she should inform the doctor immediately.

4. The strain is defined by the force that is necessary to be applied for complete compression of an artery. At high BP pulse will be *intense or hard*, and at low - *soft*.

5. The height of pulse and its size depends on amplitude of fluctuation of an arterial wall. If stroke output of the heart is increased and vascular wall tone drops pulse becomes *high* and *big*, and at low cardiac output at shock, collapse – *low and small*.

6. Rate or form of the pulse is defined by the rate of change in the volume of an artery. The fast stretching and the falling of an artery is typical for a quick *pulse* (at aortal regurgitation), and the slow expansion and falling – for *slow* one (it is typical for an aortal stenosis).

A nurse puts down the data of pulse in a temperature chart (marks by points of red color).

BLOOD PRESSURE, PROCEDURE OF ITS TAKING

Blood pressure is the pressure which is generated in the arterial system during the work of the heart. Depending on a phase of a cardiac cycle, blood pressure (BP) is named *systolic (SBP)*, i.e. it arises in arteries after systole of a left ventricle (corresponds to the maximal heaving of pulse wave), and *diastolic blood pressure (DBP)* is *maintained* in arteries during diastole due to their tone (corresponds to the fall of pulse wave). The difference between magnitudes of a SBP

and DBP is named *pulse pressure (PP)*. Blood pressure is measured in millimeters of a mercurial pole, shortly in mmHg.

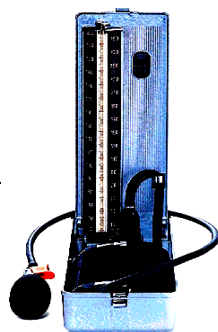
Why is it necessary to know the figures of blood pressure? Blood pressure is one of the major parameters of functioning of an organism; therefore it is necessary for everyone to know it. Growth of BP every 10 mmHg increases risk of the development of cardiovascular diseases by 30%. People with elevated BP have strokes (insults) 7 times more often, coronary heart disease 4 times more often, the lesion of the leg's arteries 2 times more often than people with normal BP.

BP depends on the magnitude of heart output, total peripheral vascular resistance, frequency of cardiac contractions, and volume of circulating blood. Taking of blood pressure is the important method of monitoring the state of hemodynamics both in healthy and ill people.

In usual medical practice standart² method of taking blood pressure is an indirect method with the help of pneumatic cuff of the special device – a sphygmomanometer (Greek “phygmos” - pulse + a manometer: Greek “manos” - fluid, scarce, diluted tissue; “metron” – measuring, an instrument for definition of gases or fluid pressure, namely for taking blood pressure). Blood pressure can be taken by Korotkov method of auscultation (in real practice), and by palpation (i.e. Riva-Rochchi method).

Depending on the construction of a recording part of a sphygmomanometer the latter are divided into *mercurial* sphygmomanometers (the most precise) [Fig. 16], *aneroid* (spring) sphygmomanometers (quite often underestimating BP) [Fig. 17] and *electron* sphygmomanometers [Fig. 18].

The sphygmomanometer consists of hollow cuff with inflatable rubber cavity, *rubber bulb* ("pear") with the valve and a screw lock, *a manometer* (mercurial, mechanical or electron) and *rubber tubes*. Blood pressure is measured in volume of raising of a Hydrargyrum (Hg) level or resisting strength of a spring, which is transferred to the finger, moving on a dial with millimeter divisions.



the rigid catheter, inserted

² The "Gold" standard of BP measuring is interarterially.

The mercurial sphygmomanometer was created by the Italian pediatricist and *pathologist Stsipione Riva-Rochchi* in 1896³. He offered the device for taking BP, in which ring compression of a humeral artery with rubber cuff filled with air was used. During more than 100 years of its creation the device practically had not changed. This device was spread all over the world and now is called Riva-Rochchi. The sphygmomanometer allows to take BP noninvasively. The sphygmomanometer *Riva-Rochchi* could take *only systolic BP* (releasing a pulse wave after compression of an artery). The average of two values of BP was recorded: appearing at the moment of ceasing of pulse wave and then its repeated occurrence. Even then for the first time Riva-Rochchi described the effect “of a white gown” while taking BP.

Fig. 16. Mercurial sphygmomanometer.

Russian *surgeon Nikolay Sergeevich Korotkov* essentially improved the technique of indirect BP taking, having offered in 1905 a new auscultative method of BP taking. It allowed to define precisely both systolic, and diastolic BP. Firstly N.S.Korotkov's article, written in Russian, about this method did not cause any interest in Europe, but after it reached Germany, and then England, auscultative Korotkov method obtained recognition all over the world and replaced a pulse method of Riva-Rochchi.

The indirect method of taking blood pressure by Korotkov is based on the fractional decrease of air pressure in the rubber cuff placed

on an extremity, and registration of the pressure volume at the moment of appearance and disappearance of Korotkov's sounds.

³ Mercury sphygmomanometer the French doctor and physicist Jean Lui Mari Puazejl for the first time has applied to measurement of a blood pressure at animals in 1828.



Fig. 17. Aneroid (spring) sphygmomanometer.

Between the systolic BP, registered by palpation and auscultation there is a small difference: the palpative result is approximately 7 mmHg lower than auscultative. Therefore doctors with defect hearing or having no phonendoscope can define the systolic BP precisely by palpation.



Fig. 18. Electron sphygmomanometer.

It is necessary to note, that with good skills it is possible to *define a diastolic blood pressure by palpation*. It is necessary to fulfill the palpation of a humeral artery pulsation (immediately below the distal edge of a sphygmomanometers). After the definition of the systolic blood pressure with further pressure decreasing of air in a cuff the

pulse on a humeral artery *becomes considerably clearer and louder, then at same moment the normal rate of pulse increasing is suddenly reduced*. This transition point correlates well with the diastolic blood

pressure recorded *at the moment of fading* of Korotkov's sounds (the so-called IV, but not V phase, of Korotkov's sounds). At the same time to register this phenomenon by *palpation of the radial artery is practically impossible*.

So, the systolic BP determined by palpation is a little lower, and the diastolic BP is a little higher than BP determined by auscultation.

A nurse puts down the values of BP in a temperature chart as columns of red colour according to the scale of BP (in mmHg).

Recommendations on indirect auscultative blood pressure taking (Techniques of BP measuring)

1. Before taking BP a patient should rest for 5-minutes. *Too long rest (25 minutes) can decrease the systolic BP by 10 mm Hg.*
2. A comfortable, quiet atmosphere should be created. A patient leans back on a backrest of a chair, legs should be on the floor. A patient should be in a quiet, relaxed pose. A patient should not talk. A patient should not overlook BP taking (at a column of Hg or on a dial of manometer).

If a back of the patient does not lean on a backrest of a chair BP is up to 10 mmHg higher.

There can be a decrease of BP routinely within 10 mmHg with inspiration.

3. BP should be measured on both arms. *If difference in BP values makes 20 mmHg and more, it is necessary to assume lesion of the artery on an arm where BP is lower.*

4. The shoulder of a patient should be naked. It is not allowed to roll up the sleeves so that a firm band is formed around the shoulder squeezing it. However a thin sleeve under a cuff does not have any influence on BP taking.

If the cuff overlaps the clothes, BP can be overestimated by 5- 50 mmHg.

5. The hand of a patient should lie comfortably on a table with the palm upwards, muscles of an arm should be relaxed. The middle part of

a shoulder should be at the level of the heart that is at the level of the IV-V intercostal space.

If an elbow is positioned lower BP can be increased up to 6 mmHg (due to the gravity), if the hand is hanging BP can rise up to 7/11 mmHg (due to isometric contraction of muscles).

6. Pulsation of the humeral artery is found by palpation in the middle part of a shoulder.

7. A cuff. The width of a cuff should be not less than 40 % of a shoulder circumference, and the inflatable rubber chamber inside a cuff should cover no less than 80% of an arm of an adult (and 100% of an arm of children younger than 13 years). If arms are thick and the size of a cuff is rather small, it is necessary to place *the center of rubber air chamber above the humeral artery*, but not at its side. If the arm is too thick it is necessary to place a regular cuff on the forearm and take BP on the radial artery.

If a cuff is extremely narrow it may be overpumped. In that case the values of BP can be overestimated. Use of a narrow and short cuff overestimates BP up to 10/8 mmHg on an average.

Sometimes systolic BP is overestimated up to 50 mmHg. Too wide cuff underestimates BP rarely for more than 5 mmHg.

Compression of an artery necessary for BP taking can sometimes cause *discomfort or pain*. The painful sensations can cause additional elevation of systolic BP for more than 5 mmHg in women especially. The pain is caused by *regular cuff seams* present on the *perimeter of a cuff*. They not only reduce the efficient breadth of a cuff but also give it *an ellipse form*. It causes *an unequal distribution of pressure on an arm with the maximum at the center of a cuff*, therefore the *main pressure* is applied to a *small part of an arm*, located in *the center of a cuff*.

Now the so-called painless SlimFit from A&D cuffs (see also the following chapter «Oscillometric method of BP measuring») are produced. The new construction of such cuffs helped to get rid of the seams. There is only *one* (welded) *seam* placed in *the middle of such a cuff*. Due to the use of one seam the efficient width of a cuff increases. During a pumping of air the inner chamber of such a cuff takes a

cylindric form which provides *equal distribution of pressure on an arm along all surface of a cuff* and *does not cause pain and additional*

elevation of systolic BP.

Cuffs for an arm with shoulder circumference of 22-32 cm are usually used. If the circumference of an arm exceeds 32 cm one of the two following situations can appear: 1) a cuff fixed with *an effort* can cause *additional elevation* of BP in some cases over 10 mmHg, therefore the values will be overestimated; 2) at great size of an arm it is impossible to fix a cuff and to take BP at all.

If a cuff is too large, it is necessary to use a cuff of the smaller size.

In modern SlimFit cuffs there is a special mark on their interior surface allowing to find out the exact size of a cuff necessary for a patient.

8. If there is some air left in a cuff it's thoroughly removed.

9. The middle part of a rubber bulb of the inflatable chamber of a cuff should be placed precisely above the palpated humeral artery (in the middle part of a shoulder, see item 5).

Inaccurate placement of a cuff increases BP up to 4/3 mmHg.

10. It is necessary to wrap up tightly and to fix a cuff around the naked arm of a patient. However a cuff should not be fixed too tightly: 1 finger should pass between a cuff and a patient's shoulder.

Loose attachment of a cuff can lead to overestimation of BP.

11. The lower edge of a cuff should be 2 cm above the cubital fossa (about 2 transversal fingers).

12. The outlet of a rubber tube should be below the cuff, out of the cubital fossa. It should not affect the subsequent auscultation of the artery.

13. It is necessary to place manometer so, that the center of a mercurial column or an aneroid disk would be at the eye level of a doctor. The zero level of a mercury column of the sphygmomanometer should be at the cubital fossa.

14. It is necessary to define, how high the pressure should be risen in a cuff (the definition of the maximum level of air pumping into a cuff). It can be made by two ways, i.e. by palpation and by auscultation.

14.A. Palpation method

For this purpose it is necessary to define the preliminary maximum level of air pumped into a cuff before auscultative BP taking.

Actually one has to assess by palpation the level of the systolic BP according to Riva-Rochchi method. It is necessary to pump up a cuff quickly approximately up to 70 mmHg and gradually elevate the pressure by 10 mmHg simultaneously feeling the pulse on *the radial* artery. One registers the pressure at which the pulse disappears and then with deflating of a cuff it appears again. This preliminary palpation method gives a necessary approximate notion of the systolic blood pressure and allows later in auscultatory BP taking by auscultation to pump up a cuff up to the necessary level. It is necessary to add 30 mmHg more to the indications of a manometer in palpation examination.

This procedure is necessary:

1. For the definition of systolic BP in the least discomfort for a patient, because pumping of air into a cuff with some “extra” supply up to high figures can cause pain in an arm, vascular spasm and overestimation of BP. Besides overpumping of a cuff leads to the loss of time while subsequent deflating.

2. To avoid possible mistakes due to the auscultatory gap (in this case undiagnosed), the so-called zone of silence, - a silent interval between the systolic and diastolic BP (in patients with AH). So if “to stop” without any reason at some level of BP while pumping a cuff, it is possible “to stop” exactly at the auscultatory gap.

Missed auscultatory gap can naturally “lower” the systolic BP by 10-50 mmHg and “increase” the diastolic BP (the last happens rarely).

Auscultatory gap is a period of the complete absence of sound phenomena in the interval between systolic and diastolic pressure⁴. Korotkov's sounds corresponding to the true systolic BP after temporarily occurrence disappear and appear again after BP decrease in a cuff up to 10-20 mmHg. This gap occurs at the overflow of forearm veins and accompanying retardation of the arterial blood flow

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at the increased tissue pressure below the location of a cuff that reduces a pressure gradient. This gap is seen in aortic stenosis, in the elderly

with aortic sclerosis, in patients with AH. Increase of tissue pressure is promoted by slow pumping of air into a cuff (see below).

To prevent occurrence of an auscultatory gap a patient must close and open his fist several times (about 10) before inflation of a cuff. The cuff is already placed on a shoulder of a patient, but is not inflated. It increases blood flow, dilates vessels of the forearm and accordingly enlarges a gradient of pressure between proximal and distal sites of subsequently compressed arteries.

Small physical efforts made by a hand do not affect BP.

14.B. Auscultatory method.

The palpative definition of the “starting” level of the systolic BP by the pulse disappearance on the radial artery (before the use of a phonendoscope) *is inessential*. It is possible *to inflate a cuff instantly before the disappearance of Korotkov's sounds* (it is not more difficult, than before cessation of the radial artery pulsation).

Pressure in a cuff should not exceed systolic BP for more than 30 mmHg. Therefore (without palpative definition of systolic BP) it is necessary to pump up a cuff quickly approximately up to 140 mmHg, and then try to listen to Korotkov's sounds in the cubital fossa (see item 15). If Korotkov's sounds are heard, it is necessary to increase the pressure in a cuff up to 10 mmHg, then to repeat auscultation. It is necessary to follow this sequence of actions until Korotkov's sounds stop to be auscultated. Thus, the necessary (“starting”) level of pressure in a cuff will never be exceeded for more than 10-20 mmHg.

15. To define a point of a maximal pulsation of the humeral artery by palpation located usually directly above the cubital fossa on an internal surface of a shoulder.

The membrane of a phonendoscope should be pressed closely to this place. It is not necessary to press strongly. It is necessary to keep in mind, that Korotkov 's sounds are mainly of low-frequency and the membrane of a phonendoscope is intended for the auscultation of high-frequency sounds.

Excessive pressure on a phonendoscope funnel “decreases” diastolic BP up to 9 mmHg and more (because of an arising turbulent blood flow in a place of pressing of a phonendoscope while applying

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additional compression of the humeral artery). You can listen Korotkov 's sounds in some peoples up to zero.

⁴ According to Z.D.Kobalava and J.V.Kotovska (2001), “auscultative gap is a period of absence of a sound between I and II phases of Korotkov's sounds”; according to N.A.Muhin and V.S.Moiseev (2002), “auscultative gap is a period of absence of a sound between phases I and II of Korotkov's sounds”.

16. Quickly and evenly pump up air into a cuff until pressure reaches preliminarily palpatively defined level of systolic BP + 20-30 mmHg.

Pumping of a cuff by a patient himself does not affect measuring of BP (American Heart Association, 1993).

Slow pumping of air into a cuff leads to failure of venous outflow (as before compression of an artery a cuff plays a role of the venous tourniquet and results in elevation of tissue pressure, pain in a shoulder and to "blurring" of clarity of Korotkov's sounds.

17. To open the valve slightly and gradually let out the air from a cuff at a speed of 2 mmHg per a second simultaneously listening to the appearance of Korotkov's sounds and observing the indications of a manometer scale or mercury level.

At the beginning of the cuff blowing out the slow *decrease of pressure* is considered to be *preferable*. In initial compression of the arteries the arterial spasm occurs. Besides a patient can *be anxious and worried about* unpleasant sensations arising in cuff inflation. It can result in momentary transitory rise of BP. At *slow decompression the vasospasm and alarm* disappear by the time when restoration of the blood flow under a cuff recurs.

Too slow deflating of a cuff results in congestion of blood in the forearm, weakening Korotkov's sounds and finally in rising of BP (mainly diastolic) up to 2/6 mmHg. Too fast deflation of a cuff can "decrease" systolic BP and "increase" diastolic BP.

18. Note indications of a manometer at the first appearance of pulse tones (phase I of Korotkov's sounds - systolic BP), and at their disappearance (phase V of Korotkov's sounds –diastolic BP).

During the period when Korotkov's sounds become audible a cuff deflation should not exceed 2 mmHg per every pulse beat - that is to be "from sound to sound", compensating thus both fast and slow cardiac rhythm.

Korotkov's sounds are hardly heard in some patients (a thick or muscular shoulder, arterial atherosclerosis, etc.). The better auscultation of sounds is promoted by emptiness of the venous bed of

an arm. For this purpose before inflation of a cuff it is necessary to ask a patient to lift an arm above his head and then to clench and unclench

his fist several times (up to 10). After that Korotkov's sounds are heard better.

19. When Korotkov's sounds are not heard anymore it is necessary to continue auscultation and to reduce slowly pressure in a cuff by 10 mmHg at least, in diastolic BP above 90 mmHg, in other cases by 10-20 mmHg to be sure that no other sounds are audible.

After that it is necessary quickly and completely to deflate a cuff.

20. A patient needs to have a rest for 30 seconds at least.

21. BP indices are expressed as the closest largest *even (divisible by 2) numbers with approximation of 2 mmHg*. It is justified from the scientific point of view to give figures multiple 5 (that is up to the number which ends on 0 or 5). The approximation to the closest number multiple 5 allows to *speed up examination*; because of *spontaneous fluctuations of BP arising from time to time*, measurement within the proximate *even number is rather difficult* and takes time. For example, record "120, 125, 130", etc. mmHg is rational.

The national bureau of standards (USA) has established, that the maximum reproducibility of measuring with sphygmomanometer⁵ makes ± 3 mmHg, that is the mistake of the Korotkov method is usually equal to 5-7 mmHg.

22. As a rule BP at the first taking appears to be higher than in following measurings. Therefore it is recommended to repeat measuring (to measure BP 3 times) with an interval not less than a minute, not taking a cuff off and after complete deflation of a cuff before each measuring. *Optimally average value from the last two measurings is taken.*

If indices of diastolic pressure after repeated measurings differ for more than 8 mmHg it is necessary to perform two additional *measurings, until stable findings are received.*

According to the classical method of WHO, BP is measured three times with intervals not less than 5 minutes and in the patient's chart the lowest BP is written down (the data of vice-president of RAMS, the

academician of RAMS A.I.Martynov, 2000).

The lowest BP is recorded in the morning on an empty stomach

⁵ At the same time by statistics, the greatest amount of cerebral insults and myocardial infarctions, often having a fatal outcomes, is marked from 6 o'clock till 10 o'clock when there is evolutionally produced fast rise of BP.

while staying in bed, just after sleep⁶. Such BP is called *basic* or *basal*. The range of BP within a day can reach 30/20 mmHg. It is necessary to remember that BP is very changeable and quite often decreases during observation. That's why it is necessary to observe a patient during some time before diagnosing essential (arterial) hypertension.

Taking BP in a standing position

Taking BP in a standing position is performed using a special stanchion with adjustable height and supporting surface for an arm and a sphygmomanometer. The middle of a cuff should be at the heart level. In a standing position BP is usually 5-10 mmHg higher than in a recumbent position.

By taking BP in a standing position the tendency to an orthostatic hypotension is revealed. Decrease of systolic BP by 20 mmHg and more is maintained after 1-3 minutes of patient's changing from recumbent position into a standing one.

Taking BP in a standing position should be carried out first in patients over 65, in patients with diabetes mellitus, in those who receive antihypertensive therapy and during a patient's first coming to a doctor.

Taking BP on legs (especially in the first revealed arterial hypertension in young people)

For taking BP on legs use wider and more lengthy cuff than one used for measuring BP on arms (18 cm x 42 cm). Contraindication for taking BP on the lower extremities is an acute thrombophlebitis of veins of the lower extremities.

The order of actions:

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1. A patient *lies down on the abdomen*.

BP can be also measured in a patient lying on his back. For this

⁶ Aneroid (spring) auscultative and oscillometric semi-automatic sphygmomanometers get the increasing value owing to restrictions on application of Hydrargyrum (in the European countries). However these sphygmomanometers should pass examination every 6 months under standard reports by comparison of their parameters with the measurements performed by a mercury sphygmomanometer.

purpose it is necessary to bend a leg of a patient so that the foot stands on a couch.

2. A cuff is placed at *the middle of a thigh*. The middle of a cuff should be at the heart level.

3. A phonendoscope is applied to *popliteal fossa*.

4. BP is determined according to Korotkov.

With thigh compression *the discomfort* (pain) appearing approximately at one third of patients can be severe enough and can even cause transitory elevation of blood pressure. That's why for taking BP on legs *arteries of crus* (calf) are used as an alternative.

The advantages of taking BP on crus consist in the possibility of using usual (shoulder) cuff and convenience (painlessness) for a patient. A disadvantage of this method is that approximately in 10% of patients Korotkov's sounds can not be auscultated over the posterior tibial artery and arteries of the back of foot. In this case it is possible to use an ultrasonic method, i.e. dopplerography.

For taking BP on a *crus* usual shoulder cuff is placed directly *above the malleolus*. Posterior tibial artery is auscultated behind the medial malleolus. If it is not auscultated the auscultation can be performed on the artery of back of foot. A small (pediatric) funnel of phonendoscope is used for auscultation.

It is important to understand *that in direct intra-arterial (with the help of a catheter) BP taking on femoral arteries the indices of systolic and diastolic BP on legs and arms will be the same*.

By using indirect method of BP measuring (by Korotkov) the normal systolic BP *on the lower extremities is slightly higher* than on the upper extremities, i.e. by 10-15 mmHg. *Sometimes the equal indices are revealed* but after physical exertion BP on the legs increases⁷. It is typical for people of all ages irrespective of the presence or the absence of AH. The explanation for this phenomenon is the following: in peripheral arteries there occurs *a summation of initial antegrade pulse waves* with the secondary retrograde waves generated by elastic

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reflection of a wave by peripheral arteries of the inferior half of the body. This fusion of waves results in augmentation of amplitude and the

⁷ However B.Bates with coauthors (2003) specify, that «at use of cuffs of the necessary size for an arm and a leg BP should be the same on a leg and on an arm (use of a usual cuff for taking BP on a leg results in the overestimated results)».

increase of speed of wave elevation in the peripheral arteries in comparison with central ones. The waves appearing as a result of such summation are called *standing*. Because of the peculiarity of a wave rolling away this superposing of two waves occurs only in the lower extremities. This phenomenon of fusion is similar to sea waves which become higher approaching to the coast.

The higher difference (as it was mentioned, normally the difference is not more than 10-15 mmHg) *between BP on arms and legs* (that is the difference by 20 mmHg and higher – by 60-100 mmHg) is termed *the Hill's⁸ symptom*. The Hill's symptom, that is the increase of normally observed difference in systolic BP on arms and legs, arises in hyperkinetic states (at a high stroke output of blood) in which the magnitude of standing waves can considerably increase (for example, in aortic incompetence, hyperthyroidism, etc.).

Lower systolic pressure in the lower extremities as compared with that in upper extremities in young patients is seen in coarctation of aorta, in the elderly – in atherosclerotic obstruction (or dissection) of aorta. Thus systolic BP on legs is at least 6 mmHg lower than on arms.

Auscultative method of taking BP by Korotkov is the main method in the medical practice officially approved by the WHO.

However it has both advantages and disadvantages.

The advantages of auscultative method of BP taking

1. This method is recognized *as an official standard of noninvasive BP taking for the diagnostic purposes and at verification of automatic devices for BP taking*.
2. The high stability towards arm movements.

The disadvantages of auscultative method of BP taking

1. The results of measuring depend on individual features of a person, who takes BP: good vision, hearing, coordination of the system “an arm – vision – hearing”.

2. The auscultative method of BP taking is sensitive to the noise in a room, accuracy of a phonendoscope membrane location as to an

⁸ Sir Leonard Hill (1866-1952) —English physiologist, in 1923, became a Nobel Prize laureate in physiology.

artery.

3. The auscultative method of BP taking is technically complicated (there is a probability of inaccurate indices at measuring) and demands special training.

Nowadays *an oscillometric* method of BP taking is widely spread.

Oscillometric method has been offered by the French physiologist E.Marej in 1876 but for a long time it was not very popular because of technical complexity.

The oscillometric method of BP forms the basis of the majority of electronic devices, performing BP taking in automatic and semi-automatic conditions. These devices are used for daily monitoring of BP (*DMBP⁹*) and for home measuring for self-control.

Oscillometric method of BP taking is not based on the electron analysis of Korotkov's tones in a decompression but on the mathematical analysis of pulsation of the pressure in a cuff. The modern *digital (figure) technologies use analogue digital converter* for transformation of nonelectrical measured parameter (for example, BP) into an electrical signal (amplitude and so on) and *microcomputers for the analysis of the received information*. Thus in oscillometric device (besides a cuff and a pressure and pulse sensor) the analogue digital converter, a microprocessor with the program of pressure definition (and also of pulse) and the display are used.

Increase of pressure in a cuff up to the starting level is achieved by the device (both in semi-automatic and automatic regimes) for account of technological use of the so-called “artificial intellect”.

During this procedure *the pressure decrease* in a cuff is performed by *stages*. The algorithm of the device defines the rate and the magnitude of air deflation. At every stage *the amplitude of pulsing of the air pressure*, appearing in a cuff with passage of blood through an area of an artery pressed by a cuff is analyzed.

Systolic BP corresponds to the most rapid increase of a pulsing amplitude, diastolic BP to the rapid weakening of pulsation.

The advantages and disadvantages

⁹ As it issued in the last years the estimation of BP according to DMBP data has essential advantages over estimation of BP by Korotkov in respect of organs-dartboards at AH.

of oscillometric method of BP taking¹⁰

The advantages:

1. It does not depend on individual features of a person taking BP (quality of vision and hearing, coordination of the system “arms – vision – hearing”).

2. It is not affected by noise.

3. It allows to take BP at expressed «auscultative gap», «the indefinite sound», weak Korotkov's sounds.

4. The values of BP do not depend on a turn of a cuff and its displacement along the shoulder.

5. It allows to perform measuring without losses of accuracy through thin clothes.

6. Special training is not required.

Disadvantages:

1. An arm should be immobile at taking BP.

2. The BP values received by oscillometric and auscultative methods can slightly differ.

The oscillographic definition of BP has doubtless advantages in the presence “of an auscultative gap” or a phenomenon of the continuous tone in a patient.

It is shown that in usual situations normal values of systolic BP taken oscillometrically can be 6-8 mmHg higher than those received with auscultation. And, vice versa, diastolic BP taken oscillometrically is 3-5 mmHg *lower than taken* by auscultation.

In arterial hypertension when functional and anatomical remodeling of arteries takes place (“an artery becomes taut like a string”) the results of BP received by both methods *nearly coincide*¹¹.

The oscillographic method allows estimating the state of a vascular wall, tension of a vessel, the blood flow rate. During the

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computer processing of a signal stroke (SV) and minute (MV) volumes

¹⁰ Accuracy of an oscillometric instruments, taking BP, released by different producers is different. Devices of A&D (“A” – analog; “D” – digital) – this is a device of the only company in the world, which produces professional and home meters of BP, having the *highest accuracy on international classification*. A&D – the owner of patent (“Oscillometric digital blood pressure monitor”, 1984) first in world home electronic meter of BP and pulse.

¹¹ Experts of the Ministry of Health Care of the RF recommend devices A&D, both to patients for independent measurement of BP, and to doctors for carrying out dynamic supervision over a level of arterial pressure in clinics.

of the heart and their coefficients, total peripheral vascular resistance (TPVR) and vascular conformity are calculated.

The concept of arterial hypertension, hypertensive crisis, arterial hypotension

The border between the normal and elevated BP, i.e. arterial hypertension (AH), is connected with the notion of the frequency of cardiovascular diseases development (stroke and myocardial infarction) depending on BP level.

As it turned out, there exist a continuous linear (direct) relationship between BP level and cardiovascular risk, i.e. risk of the development of cardiovascular diseases and cardiovascular mortality. Actually, there are no true threshold BP values below which the risk of cardiovascular diseases would be the lowest. That is why the experts of the European society on the research of arterial hypertension (2003) now say, that “it would be expedient to use classification of BP level without using the term “hypertension”.

Nevertheless, large-scale (on many thousands of patients with AH) research carried out last years show that *the least risk* of the development of lethal CHD is spread among men with BP indices *less than 115/75 mmHg*. Further this risk is doubled for every BP elevation by 20/10 mmHg.

However, nowadays *such level of BP* above which *the risk of development* of cardiovascular morbidity and *mortality considerably (!) grows*, is considered to be *significant, actual arterial hypertension. Such level (threshold of arterial hypertension) prolongs to be considered a level of BP at 140/90 mmHg* (at the usual “office” BP taking in a doctor’s consulting room). This level being a result of consensus, i.e. the general agreement of scientists, remains to a certain extent conditional.

Because of *different methods of BP recording* used now, *threshold values of BP* for AH diagnosis *are various*.

1. The above mentioned BP level of 140/90 mmHg is *a threshold value* for diagnosis of AH in BP taking at a doctor’s consulting room (or at nurse’s one). Such measuring is called *an “office” BP taking*, and BP

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itself – *an “office” blood pressure*.

2. During home *BP taking* (for self-control), especially at averaging of BP indices taken during several days, threshold value of BP for diagnosis of AH is 135/85 mmHg (that is 5 mmHg lower than the “office” one).

3. During *ambulatory instrumental 24 hour BP taking (daily monitoring of blood pressure) with 15 minute intervals during a day and 30 minute intervals at night, the threshold BP value for AH diagnosis is already 125/80 mmHg (125/80 mmHg is an average daily index of BP).*

It is necessary to understand that in any person including an absolutely healthy one, BP is not constantly “normal”, it is unstable. BP can increase, when a person runs, performs some physical work, reacts emotionally on various life situations and etc. To create more favourable conditions for the given situation, an organism itself regulates the blood pressure level. But, as soon as the action of this or that factor causing situational blood pressure elevation ceases, BP becomes normal within 5-10 minutes. If its decrease takes more time or does not decrease at all, it is manifestative of arterial hypertension development.

Experts of the WHO use the term “arterial hypertension” describing *steadfast increase of blood pressure*. The basis of this definition consists of two determinatives: *increase* and *persistence*.

Persistence of BP increase can be determined only on the basis of repeated measurements during the long term follow-up. Detection of high BP as a result of single, casual BP taking is insufficient for AH diagnosis. It is necessary to take BP 3 times in 2 different investigations at least with the difference not less than a week before putting the diagnosis of AH in an examined person.

The scientists of our country give various definitions of AH, emphasizing different components of this complicated disease. So, V.A. Almazov states, that “hypertensive disease [arterial hypertension] is a chronically proceeding disease. Its basic manifestation is the syndrome of arterial hypertension not associated with the presence of pathological processes at which BP increase is caused certain causes”. According to A. I. Olbinskaya, “arterial hypertensions are morbid conditions at which BP increase is not caused by the natural demands

of an organism in some physiological situations, but is a consequence

of disbalance of the regulation system of BP”.

In the long run AH is divided into primary hypertension, or essential hypertension (when the cause is not clear), and secondary hypertension, or symptomatic hypertension (when the cause of BP consists in the disease of a concrete organ).

According to N.A. Mukhin and V.S. Moiseev, “arterial hypertension is an increase of diastolic BP higher than 90 mmHg and systolic BP higher than 140 mmHg. It is registered during repeated BP measurements at different time (3 at least) in quiet atmosphere. In this case a patient should not take increasing or decreasing BP medications”.

It is necessary to measure BP on both arms, and in young persons – on legs in AH revealed for the first time.

In 2000 the first Russian national recommendations on AH (RAH-1) have been developed. They are created on the basis of the American recommendations formulated in the Reports of the JNC (Reports of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure), namely of the 6-th Report of the JNC (JNC-VI, 1997), Recommendations of the World Health Organization (WHO) and the International Society on the struggle against AH (ISAH) (1999). It is necessary to note, that *the purpose* of these recommendations is just *educational*¹², but not ordering.

Classification of BP levels in the adults according to the Russian recommendations on AH (2000) is shown in table 1.

In 2003 the next - 7-th report JNC (JNS-VII, 2003) was published, in which the former classification of AH (JNC-VI, 1997) was transformed as follows (tab. 2).

¹² However in connection with that in Russia modern recommendations on AH are slowly introduced into practice. Ministry of Health of the RF in 2003 issued the special Order in which these recommendations were authorized. It is supposed, that with the help of this Order work on the struggle against AH will be organized more effectively in Russia.

Table 1

Classification of blood pressure levels
according to JNC-VI and RAH-1

CATEGORIES OF BP	SBP (mmHg)	DBP (mmHg)
<i>Categories of normal BP:</i>		
Optimal	<120	<80
Normal	<130	<85
High normal	130-139	85-89
<i>Categories of high BP:</i>		
Arterial hypertension of the 1 st degree	140-159	90-99
Arterial hypertension of the 2 nd degree	160-179	100-109
Arterial hypertension of the 3 ^d degree	≥180	≥110
Isolated systolic hypertension	≥140	≤90

Table 2

Changes in classification of BP levels
according to JNC-VI (1997) and JNC-VII (2003)

JNC-VI (1997)	JNC-VII (2003)
SBP/DBP (mmHg)	
Optimal	<120/80 → Normal
Normal	120-129/80-84 → Prehypertension
High normal	130-139/85-89
Hypertension	≥140/90 → Hypertension
Arterial hypertension of the 1 st degree	140-159/90-99 → Arterial hypertension of 1 st stage
Arterial hypertension of the 2 nd degree	160-179/100-109 → Arterial hypertension of 2 nd stage
Arterial hypertension of the 3 ^d degree	≥180/110

The next BP classification according to JNS-VII (the USA, 2003) is shown in table 3.

Table 3

Classification of BP levels according to JNC-VII (USA, 2003)

Characteristic of BP	SBP (mmHg)	DBP (mmHg)
Normal BP	<120	<80
Prehypertension	120-139	80-89
1 st stage of BP	140-159	90-99
2 nd stage of BP	≥160	≥100

Thus:

- 1) AH classification *was simplified*;
- 2) the levels of BP «less than 120/80 mmHg» but not «less than 130/85 mmHg» as it was in classifications of JNC-VI and RAH-1 started to be classified as “normal BP”;
- 3) “*prehypertension*” category which united categories earlier classified as «normal BP» and «high normal BP» was created;
- 4) instead of 3 degrees of AH *two stages of AH are defined*, divided by the level of 160/100 mmHg (BP less and more than 160/100 mmHg).

Thus, criteria of AH diagnosis “become tougher”, i.e. they are displaced to the side of the lesser values of BP which start the actual “readout” of elevated BP.

Now it is considered, that *the real threshold level of AH in every concrete person should be adaptable* and it can increase and decrease *depending on the total level of risk of the development* of cardiovascular diseases in every individual.

The new category “prehypertension” allows to select persons with high risk of AH development who should follow a healthy way of life in order to avoid AH in future. However it’s not yet necessary for them to take antihypertensive medications. At the same time *persons with prehypertension in association with diabetes mellitus and/or renal diseases should already take medicinal antihypertensive therapy* if the change of way of life does not decrease BP up to 130/80 mmHg and lower.

The formulation of only two stages of AH – with singling out of the second (and its last) stage of AH of “more than 160/100 mmHg” – redoubles doctors’ attention to all patients with AH, beginning from the

BP level of more than 160/100 mmHg, instead of >180/110 mmHg as it occurred earlier in special singling out this third degree of AH.

It is necessary to know, that the main purpose of treatment of AH patients is the prevention of the development of AH complications that is the maximal decrease of the risk of the development of cardiovascular complications and fatal outcomes, but not the elimination of the main symptoms, that is only the decrease of BP as such.

It is necessary not only to reduce BP down to the so-called target level (BP \leq 140/90 mmHg) but to correct all modified cardiovascular risk factors – smoking, lipid disorders, etc. and also to treat such accompanying diseases as diabetes mellitus etc. for achievement of this purpose.

The realized participation of a patient in this treatment and prophylactic process is very important. Nowadays it is considered that to create individualized, training programs increasing awareness of patients about their illness and promoting the efficiency of the active (actually for life) therapy of AH is more effective. However the introduction of such programs into life is a rather difficult process because of low motivation of patients with AH to the treatment, caused in the greater degree by the absence of complaints due to rather good tolerance to BP increase.

It is necessary to pay great attention to the observance by a patient of all requirements of a medical regimen, since negative emotions, neuro-psychological stresses, bad sleep can aggravate the course of AH disease.

The sharp increase of blood pressure is called *hypertonic crisis* and is accompanied by severe headache, dizziness, nausea, vomiting. The hypertonic crisis needs urgent medical approach and administration of antihypertensive medicine, since it can result in disturbance of coronary and cerebral circulation. Before doctor's coming it is necessary to provide complete rest, access of fresh air, it is possible to make hot foot baths and warm baths for hands (37-40°C) to a patient.

The arterial hypotension can be met among completely healthy people, especially among asthenics, but it can be a symptom of serious diseases accompanied by decrease of cardiac output, a vascular tension,

decrease of blood circulation volume (myocardial infarction, bleeding, shock, collapse). It is necessary to lay a patient, to lift the foot end of a bed for the improvement of cerebral blood inflow, and to give some medicine according to a doctor's prescription.

THE BASIC SYMPTOMS OF CARDIOVASCULAR DISEASES. NURSING THE PATIENTS WITH CARDIOVASCULAR DISEASES

Heart pain

Assessing a patient's complains of heart pain it is necessary to remember, that pains are not always caused by cardiovascular disease, and can be connected with pleural disease (dry pleuritis), pathology of the backbone and intercostal nerves (osteochondrosis, intercostal neuralgia), myositis, hernia of the esophageal hiatus diaphragm, etc.

The chest pains, connected with pathology of the blood circulation system, can be caused by the diseases of pericardium, aorta, neurotic condition.

Stenocardia attack [Greek “stenosis” - narrowing, “kardia” - heart; synonyms: angina pectoris (Lat. “ango” - to compress, “pectus” - breast), Geberden disease] is a result of the narrowing of coronary arteries due to the atherosclerotic process or spastic stricture. Thus there develops a disharmony between myocardial requirement in oxygen and opportunities of the coronary blood flow which results in hypoxia of the cardiac muscle, metabolism is disordered in it, and incompletely oxygenated metabolic products irritate the sensitive nerve endings in the myocardium, causing a pain attack.

In a typical case angina pectoris attack is provoked by the physical or emotional exertion; pains are retrosternal, have a pressing, burning or compressive character. They irradiate to the left shoulder, arm, the left half of the neck, the mandible, and last from 1 to 10 minutes and pass independently at rest, or in 1-3 minutes after the sublingual reception of a nitroglycerin tablet.

The first aid to a patient in angina pectoris attack consists of maintenance of the complete rest, sublingual nitroglycerin reception and rarely the application of a mustard plaster on the heart area.

A very serious disease which as a rule complicates a durable non-arrested angina pectoris attack is *the myocardial infarction* at the basis of which is the necrosis of a cardiac muscle.

The most frequent so-called typical (painful, anginous) variant of myocardial infarction is characterized by the development of retrosternal severe pains, stopped neither at rest, nor by nitroglycerin reception which last more than 30 minutes (to several hours). These pains are accompanied by the feeling of fear, dyspnea, sharp weakness, decreasing of blood pressure, etc. For such patients urgent hospitalization is necessary to the intensive care ward supplied with all necessary equipment for monitoring (automatic constant tracking) of their condition (first of all the cardiovascular system condition) and carrying out of reanimation actions if necessary. A patient is confined to bed within the first days; during this period it is necessary to control the changing of patient's bed-clothes, performance of all hygienic procedures, patient's feeding, a bedpan or an urinal giving, etc.

Shortness of breath, cardiac asthma and pulmonary edema

Shortness of breath in cardiovascular diseases is one of the attributes of *heart failure*. The heart failure is caused by the progressing decrease of myocardial contracting function, congestion in the pulmonary circulation and liquid retention in the body. In *shortness of breath* of the cardiac origin blood is accumulated in the pulmonary circulation and a patient experiences a painful feeling of lack of air in the physical exertion and stress at first, and later at rest as far as the disease progresses.

Dyspnea (cardiac asthma) in heart failure is a sudden severe attack of *shortness of breath*, accompanied by noisy breathing, more frequently occurred at night (because of the increased tone of a vagus nerve, which causes a narrowing of coronary vessels). Thus a patient is compelled to take a sitting position. The cardiac asthma attack develops in sharp decrease of the contracting ability of the cardiac muscle due to its necrosis (myocardial infarction), inflammation (severe myocarditis) or overloads (hypertonic crisis, an inadequate exercise).

Pulmonary edema is the most serious manifestation of heart failure, when the liquid part of blood passes ("transudes") through the

vessel walls and accumulates in alveoli. Thus bubbling respiration and pink foamy expectoration join the symptoms of cardiac asthma mentioned already.

The first aid in shortness of breath consists in a patient's rest, giving a patient sitting or semi-sitting position, taking off tight clothes, fresh air access, nitroglycerin giving (in the absence of contraindications) or antihypertensive medicine in case of increased BP (according to a doctor's prescription).

Cardiac asthma and pulmonary edema need the active aid measures:

- 1) it is necessary to call a doctor first of all;
- 2) to give a patient a sitting position;
- 3) to take a patient's blood pressure;
- 4) to give a patient nitroglycerin sublingually, if a patient's systolic pressure is not lower than 100 mmHg;
- 5) to begin an oxygenotherapy with antifoamer through a mask or a nasal catheter (as an antifoamer 96% alcohol solution or 10% alcohol solution of antifomsilhan are usually used);
- 6) it is necessary to aspirate a foamy sputum by an electroaspirator;
- 7) after giving a patient sitting position, tourniquets are applied on the legs with the purpose of blood deposition in the systemic circulation and delay of its inflow to lungs. Thus on both legs 15 cm below the inguinal fold tourniquets or rubber tubes, or blood pressure cuffs for tonometer are applied. Only the veins are pressed, i.e. the arterial pulse below a tourniquet should be kept, while the extremities should become cyanochroic, but not acyanotic (pale); the time of tourniquets application is 15-20 minutes;
- 8) venous tourniquets should be also applied to the arms. Tourniquet removal should be carried out successively: first from one arm, after a while – from the other, etc. in a slow regimen;
- 9) bloodletting (phlebotomy) is carried out to evacuate a part of circulating liquid from the blood flow and to unload the pulmonary circulation (by a doctor's prescription);
- 10) hot foot baths are used;

11) narcotics, diuretics, inhibitors of APF, inhibitors of phosphodiesterase, creatine phosphate, cardiac glycosides, etc., are introduced intravenously by a doctor's prescription.

Edemas

In heart failure edemas are the result of the congestion in the systemic circulation and liquid delay in the body. Cardiac edemas are more frequently localized in legs (in patient's walking), or in the area of the sacrum, the loin and scapulae (if a patient lies). The skin in the area of edema becomes smooth, brilliant, tense, and in pressing it forms a fossa proceeding for a long time. In the neglected cases of heart failure the liquid (transsudate) can be accumulated in the serous cavities, i.e. in abdominal (*ascites*), pleural (*hydrothorax*), and pericardium cavities (*hydropericardium*). Edema of the whole body is called *anasarca*.

In care of patients with heart failure, it is necessary to remember, that edemas in their early stages can be latent. In these cases the liquid delay in the organism can be manifested by the fast increase in the weight and the diuresis decrease. Therefore the daily control of *the water balance* in such patients is very important, i.e. the comparison of the amount of consumed and parenterally introduced liquids with that of excreted for a day (daily diuresis).

The daily diuresis should make 1,5-2 l (70-80% of the liquid volume consumed for a day). If the amount of the excreted urine is less than 70-80% of the liquid consumed for a day, then *a negative diuresis* is stated, i.e. some part of liquid is detained in an organism. If the amount of urine exceeds the amount of drunk liquid for a day, *the diuresis is positive*. The diuresis becomes positive in edema abating in the reception of diuretics.

The water balance condition can be supervised by the weighting of a patient when the increase in the body weight testifies liquid retention. It is necessary to remember, that patients confined to bed and receiving diuretics should be provided with urinals and bedpans.

In the accumulation of the large amount of liquid in the abdominal cavity, *the paracentesis of the abdomen (transabdominal puncture)* is performed with medical and diagnostic purposes. It is necessary to be

careful in its performance, as the evacuation of much liquid in one stage can cause collapse.

In patients confined to bed and suffering from chronic heart failure there frequently occur trophic changes in places of the edema formation, i.e. in the sacral, lumbar, and scapular area. Therefore the possibility of decubital (bedsores) development is great in these places. In this connection prophylaxis of the decubital formation is especially important.

Syncope

Syncope is a short-term loss of consciousness, caused by acute sudden failure of cerebral blood supply. Usually syncope occurs due to strong psychological influences (fear, severe pain, sight of blood, etc.), a stuffy room, overstrain. Thus a patient experiences giddiness, sonitus, and dimness in the eyes, he loses consciousness. Paleness of skin and mucosa, coldness of the extremities, cold and clammy sweat, sharp decrease of BP, small and thready pulse are marked. As a rule syncope lasts 20-30 seconds and after that a patient recovers his consciousness.

The first aid in syncope consists in giving a patient the horizontal position with the lifted foot end (to provide blood inflow to the head), removal of tight clothes, fresh air access. It is possible to massage a temples and the chest of a patient, to sprinkle a face with cold water, to bring a piece of the cotton wool moistened in ammonia alcohol to a nose (for activization of the respiratory center).

Collapse

Collapse is a clinical manifestation of acute vascular insufficiency with sharp decrease of BP and peripheral circulatory failure. It is observed in acute hemorrhage, myocardial infarction, orthostase, in dehydration due to recurrent vomiting, diarrhea. Clinical manifestations are similar to those in syncope, but collapse is not always accompanied by the loss of consciousness, a patient can be come torpid, apathetic with mydriatic pupils.

The first aid in collapse consists in giving a patient horizontal position with the lowered head, stopping of bleeding, warming of a patient. In case of necessity by a doctor's prescription parenteral filling

up of the circulating blood volume is performed by injection of the whole blood or blood substitutes. The preparations which increase the vascular tone (cordiaminum, camphor, sulfocamphocainum, mesatonum, etc.) are introduced.

The diet of patients with cardiovascular diseases

The diet of patients should be sufficiently caloric, contain cellulose, the increased amount of vitamins, include products rich in potassium (baked potatoes, bananas, dried fruits, cabbage, vegetable marrows, etc.). It is necessary to limit the consumption of salt up to 3,0-1,5 g and of liquid up to 800-1000 ml a day, especially to patients with arterial hypertension and heart failure. Food should not contain products with the high content of cholesterol and refractory fats (pork, mutton, fat fish, etc.) since they cause the progression of the atherosclerotic vascular affection including coronary arteries. It is advisable to have fractional meals: 5-6 times a day, by small portions. It is desirable to have periodical fasting days (Karell's diet) and to struggle against overweight as one of the main risk factors of the cardiovascular diseases.

PRACTICAL SKILLS

Blood pressure taking

1. To suggest a patient to occupy a comfortable sitting position. The back should be supported by the backrest of a chair, while the legs should be placed on the floor. Ask a patient to take off a shirt. If he wears a shirt made of thin tissue with a short sleeve, it may be not taken off, as such a sleeve does not affect BP taking.

2. BP should be taken on both arms!

3. A patient's arm should be on a table with the palm upwards, muscles of the arm should be relaxed, and the middle part of a shoulder should be on the level of the heart (that is on the level of IV-V intercostal spaces).

4. Pulsation of the humeral artery should be found out by palpation in the middle part of a shoulder.

5. To check up the condition of a sphygmomanometer's cuff (if there is some air in a cuff it should be removed).

6. To arrange the middle of a rubber bulb flated of a cuff exactly over the palpated humeral artery (in the middle part of the shoulder), to wrap up tightly and fix a cuff around the exposed arm of a patient.

7. To check up the correctness of the cuff application: between a cuff and the shoulder of a patient 1 finger should be located, the lower edge of a cuff is placed by 2 cm above the cubital area (approximately by 2 diametrical fingers), the outlet of a rubber tube is below the cuff outside the cubital area and does not prevent the artery auscultation.

8. To place a manometer so that the mercury or aneroid disk center is at your eye level (the zero level of the mercury of sphygmomanometer should be at the cubital area).

9. To define the degree of pressure lifting in a cuff, you should use the following method: pulse palpation in the *radial* artery, with simultaneous quick pumping up a cuff approximately up to 70 mmHg and the gradual pressure enlargement by 10 mmHg. To mark pressure at which the pulse disappears (palpable definition of the systolic pressure level).

10. Palpably define the maximal pulsation point of the humeral artery, located usually above the cubital area on the humeral internal surface of a shoulder, apply tightly (but not strongly) phonendoscope membrane to this place.

11. Quickly and evenly pump up the air into a cuff until the pressure reaches the systolic BP level defined preliminary by palpation (see item 8) + 30 mmHg.

12. Open the valve and gradually let out the air from a cuff at the rate of 2 mmHg in a second, simultaneously listening to the appearance of Korotkov's sounds and observing the manometer indices or mercury level.

13. Mark the manometer indices at the first appearance of pulse sounds (phase I – systolic BP) and at their disappearance (phase V of Korotkov's sounds – diastolic BP). After the Korotkov's sounds are not auscultated, it is necessary to continue the slow decrease of pressure in a cuff by 10 mmHg at least to be convinced, that no sounds are auscultated anymore. After that a cuff is quickly and completely

decompressed (to dismiss a "release" of rubber tubes by the use of mercury sphygmomanometer).

14. After BP taking let a patient have a rest not less than for 30 seconds.

Examination of the arterial pulse

1. Pulse is defined in the various arteries – in carotid (along the anterior margin of m. sternocleidomastoideus, approximately in the middle of its length), femoral, subclavicular, humeral, and radial (more often).

2. The radial artery is palpated between a styloid process of the radial bone and a tendon of the internal radial muscle, and a hand of an examinant is placed higher of the radiocarpal joint, so that a thumb is placed down on the forearm back, and other fingers are put on its arterial (internal) surface.

3. Having felt an artery, press it to an adjoining bone, so that the pulse wave is felt as dilatation and collapse of an artery.

4. Pulse on the right and left hands can be unequal, in such cases (to assess the actual heart work) feeling of the pulse is carried out on the arm where it is better palpated.

5. For definition of the pulse rate the amount of pulse waves is counted for 15 seconds and then it is multiplied by 4. In case of arrhythmia the counting is performed within a minute.

Observation under the water balance

The purpose: to determine the urinal diurnal excretion, to assess the diuretic therapy adequacy.

Equipment: clean dry 2-3-liter jar, 2 graduated vessels.

1. On the eve a nurse warns a patient about the forthcoming procedure and the rules of the urine collection.

2. At 6 o'clock in the morning of the following day a patient should be waked for him to urinate independently or to release his urine by a catheter; this portion of the urine is not taken into account.

3. Till 6 o'clock of the following morning all next portions of the urine are inclusively collected to a jar.

4. During the whole day a patient or a nurse keep account of the consumed liquid in millileters, both drunk by a patient (the first dishes

contain 75% of a liquid, the second dishes contain 50%) and introduced parenterally.

5. The amount of the excreted diurnal urine is counted by means of the graduated vessel.

6. The measured indices are put down into a special column of a temperature chart.

Abdominal puncture

An abdominal puncture, or *laparocentesis* (Greek "lapara" - an inguen, a belly and "kentesis" - piercing), is a puncture of an abdominal cavity for liquid extraction. It is a version of *paracentesis* (Greek "parakentesis"), i.e. a puncture of any cavity in a body with the purpose of the pathological content removal.

The purpose: the removal of the accumulated fluid from the abdominal cavity in ascites, the laboratory examination of ascitic fluid (a doctor perfumes the procedure, a nurse assists).

Equipment: a sterile trochar (a metal tube with a three-edged needle inserted into it), a sterile scalpel, gloves, a syringe, a sterile surgical needle and a sutural material, 5% iodine tincture, 70% ethanol solution, sterile test tubes, sterile dressing material, a container for the ascitic fluid collection.

1. To inform a patient on the time, a place and rules of behaviour during the procedure beforehand.

2. To suggest a patient to seat on a chair, with the back tightly moved to a chair back.

3. Legs of a patient are covered with an oilcloth.

4. To put a container for ascitic fluid collection before a patient.

5. To treat hands, to put on a sterile mask, a gown, gloves.

6. To pass a syringe with 0,25% novocain solution to a doctor to carry out a local anaesthesia, to give a scalpel, a trochar to make an aperture in an arterial abdominal wall.

7. To put under the abdomen of a patient a sterile bedsheet and along with the removal of fluid to pull the ends of the sheet on themselves to prevent collapse.

8. To pass a doctor a sterile test tubes for the collection of ascitic fluid for analyses.

9. To pass a surgical needle and sutural material for the stitching.

10. To apply an aseptic bandage.
11. To watch a patient's pulse and BP.
12. To transport a patient to a ward by a wheelchair.

SITUATIONAL TASKS

1. *During the distribution of medicine in a ward of a therapeutic department one of the patients complained to a nurse of severe headache, palpitation, heart pain, feeling of lack of air. The nurse said to a patient, that the signs are harmless, and continued the distribution of medicines.*

Estimate correctness of the nurse's actions.

The answer: a nurse should stop doing her current duties, try to calm a patient, seat her in bed, take blood pressure and immediately inform a doctor about the change in a patient's condition.

2. *During feeling the arterial pulse on a radial artery a nurse placed a thumb on a frontal (internal) surface of the forearm, and other four fingers of the left hand - on its back.*

Specify a mistake in actions of a nurse.

The answer: during feeling the pulse on a radial artery the thumb should be placed on the back of a forearm, and other four – on frontal (internal) surface.

3. *During feeling the arterial pulse on a radial artery a nurse counted the quantity of pulse waves for 5 seconds and multiplied received number by 12.*

Do you agree with such technique of the pulse rate calculation?

The answer: for definition of the pulse rate (in rhythmical work of heart) it is necessary to count up the quantity of pulse waves for 15 seconds and multiply received value by 4; if pulse is irregular, it is necessary to conduct calculation within a minute.

4. *During taking blood pressure a nurse did the following:*

- placed a cuff on a shoulder of a standing patient,
- turned a patient's hand with a palm upwards,
- placed phonendoscope at cubital area over the humeral artery,

- with the help of a rubber pear with closed gate she began to pump air in a cuff, until manometer pressure in a cuff did not reached a level of 220 mmHg.

- after that she slightly opened the gate and gradually began to release an air from a cuff, and along with that she performed auscultation of a humeral artery;

- marked the level of pressure corresponding to appearance of sounds, and also a level at which the sounds disappeared.

What mistake was made by a nurse?

The answer: it is not necessary to make special requirements on taking BP, the nurse should sit or lay the patient before taking BP; pumping of air in a cuff should stop after reaching level 20-30 mmHg higher than one when pulse on radial artery disappears.

CONTROL QUESTIONS and THEMES FOR DISCUSSION

1. Techniques of the arterial pulse taking.
2. What pulse parameters should be defined?
3. What is the blood pressure and what are the methods for its definition?
4. Techniques of blood pressure taking.
5. What is arterial hypertension, hypertensive crisis and what is the first aid in hypertensive crisis?
6. What is the arterial hypotension, what is the first aid in it?
7. What is collapse and syncope? What is the first aid in these conditions?
8. What are the characteristics of typical attack of stenocardia? What is the first aid in it?
9. What are the characteristics of pain in myocardial infarction? What is the first aid in it?
10. What shortness of breath is seen in cardiovascular diseases? What is cardiac asthma and pulmonary edema?
11. First aid in cardiac asthma and pulmonary edema.
12. What are the causes of edemas in cardiovascular diseases, where are they localized and how are they called?
13. The purpose and rules of observation over water balance.
14. The purpose and a technique in transabdominal puncture.

15. What are the peculiarities of a patient's diet in cardiovascular diseases?

UNIT 7

Theme 1. NURSING THE PATIENTS WITH RENAL AND URINARY TRACT DISEASES

Goals of the class: to get a notion about the main symptoms and methods of pre-medical help in kidneys and urinary tract diseases; to master practical skills.

Objective of the class:

- to know the basis of human physiology of the urinary system, rules of observation the urination, its frequency and character; the specificities of urine collection; the methods of the first pre-medical help in urine acute retention, urinary bladder catheterization, patient's preparation for roentgenologic examination of renal and urinary tract; particularities in taking care of the patients with kidneys and urinary tracts diseases;

- to develop the skills of observing the urination, its frequency and character, taking the urine for examination, patient's preparation for roentgenologic examination of kidneys and urinary tract, urinary bladder catheterization with a soft catheter.

The subject-matter of the class:

- 1) hominal physiology of the urinary system,
- 2) the main symptoms of kidneys and urinary tract diseases and the basis of patient's general care,
- 3) urine taking for laboratory examination,
- 4) preparation of a patient for roentgenologic examination of renal and urinary tract.

Equipment required: disinfecting liquid, sterile vaseline, tweezers, grip, rubber sterile gloves, mask, gauze, cotton tampons, towel, oilskin bedding, dry clean container for collected urine.

EDUCATIONAL MATERIAL

A section of internal medicine called nephrology is devoted to the study of renal diseases. Nowadays nephrology is extremely complicated and bulky section of pathology. The difference of nephrology from any other section of medicine is that, despite relative functional welfare, therapeutic possibilities of renal diseases are very limited; at the same time within the final stage of renal insufficiency, due to the successes in technology, immunology and genetics, hemodialysis and kidney transplantation give a chance to live and even to work for critically ill or incurable patients.

Diagnosis of renal and urinary tract diseases is considerably based on laboratory urinalysis and instrumental examination of kidneys and urinary tract. Correct collection of urine and patient's preparation for examination demands much knowledge and skills. Clinical manifestations of the disease determine the peculiarities on the observation and care of the patients with renal and urinary tract diseases. Significant contribution to the development of Russian nephrology was made by professor S.S.Zimnitsky¹ - a prominent internist, one of the founders of the internal medical clinic in Russia.

Human physiology of urination

Different kidneys and urinary tract diseases are often met in the clinical practice. Various laboratory and instrumental methods of examination are used in the diagnosis of these diseases. Roentgenological methods of investigation, such as survey kidney roentgenography, computer tomography etc., play an important role in diagnosis of urinary diseases.

A process of urine excretion for a certain period of time is called diuresis, and the total amount of urine, excreted during 24 hours' period is called diurnal urine excretion. Its volume ranges from 1000 to 1800 ml, though it can increase or decrease depending on physiological

¹ Professor S.S.Zimnitsky (1873-1927) was the first director of the department of the introduction into internal medicine of the Kazan State Medical University.

conditions, the amount of consumed liquids, diet, nature of work, temperature, air humidity or presence of some diseases. 60-80% of the daily urine amount normally excretes during the daytime - a period between 8 AM and 8 PM. It should be taken into account, that a man expires 300-400 ml of water in the norm and up to 500 ml in physical exertion through the lungs. 300-400 ml of water is lost through skin, about 100 ml is excreted with feces and in diarrhea it is much more. Diurnal urinal excretion may decrease in physical exertion, hot weather or abundant perspiration.

*Main symptoms in kidneys and urinary tract diseases
and the rules of patient's general care*

Oliguria is a reduction of diurnal urine excretion to 500 ml or less. It may occur in acute and chronic glomerulonephritis, toxic kidney, renal colic, depressing tumour of abdominal cavity and small pelvis or ureter germination, etc.

Anuria is an abrupt reduction (diurnal urine excretion less than 200 ml) or complete urine absence. It characterizes heavy unfavourable disease course which may have a fatal outcome.

Ischuria is urinary retention due to impossibility to empty an urinary bladder.

Polyuria is an increase of diurnal urine excretion over 2000 ml, it is often combined with an increase of thirst and liquid consumption. It occurs both in renal and other diseases, e.g. patients with diabetes mellitus can excrete several liters of urine a day.

Pollakiuria is a quickened urination over 6-7 times a day. It occurs more often in urinary bladder inflammation, prostatic adenoma and in diseases accompanied by polyuria.

Nokturia is an excessive night urination, when larger portion of diurnal urine doesn't excrete during a daytime, as it occurs normally (a stable predominance of nocturnal diuresis over a daily one). It is one of the early symptoms of renal pathology, in elderly people especially. It is often combined with urinary incontinence in the elderly. The amount of urine in every urination can be significant or small.

Enuresis is a urinary incontinence. Among elderly men it can often be a manifestation of prostatic adenoma.

Strangury is a painful urination. It often occurs in acute cystitis and urethritis.

Renal colic, a common symptom of urolithic disease, refers to a number of renal urgent conditions. An abrupt disorder of urinary outflow in ureteral stone occlusion leads to pressure increase in a renal pelvis, renal capsule sprain and pain attacks. Acute pains are localized in a lumbar region, spread along the ureteral way into the inguinal area and genital organs. The first aid consists in the warmth use: hot-water bottles applied to the lumbar region or 10-20 minute water bath (+38 +39°C). Spasmolytic and analgesic medications are also prescribed.

Urgent help in *urinary retention* consists of the immediate urine evacuation from the urinary bladder. Self-urination can be stimulated by a sound of running water, warm water irrigation of the genital organs, hot-water bottles application (if there are no contraindications) to the suprapubic area. If these measures are ineffective, urinary bladder catheterization should be performed.

Arterial hypertension is a common symptom in renal diseases. Constant systematic control under arterial pressure is performed; antihypertensive (hypotensive) medication is prescribed in a diagnosed case.

Acute renal insufficiency appears as a result of nephrotoxic poisoning, disorders of urinary outflow from kidneys and in shock. It is manifested by poor general condition with consciousness disorders, signs of cardiovascular insufficiency, vomiting and oliguria. In some cases it may have a fatal outcome. Hemodialysis, gastric irrigation, shock-preventing measures are performed depending on the concrete situation.

Chronic renal insufficiency (with uremic terminal stage) appears as a result of prolonged course of chronic renal disease and is characterized by the gradual reduction of renal concentration function and reduction of nitrous residue excretion. Protein limited diet (30 - 40 g a day, and in severe cases 20 -25 g a day), salt consumption limitation (2-3 g a day) is indicated in these cases. Repeated gastric lavages, cleansing enemas with 2% sodium hydrocarbonate solution are performed; acid-basic correction is carried out in severe uremic lesion of the gastrointestinal tract. In severe cases hemodialysis is performed.

Observation under changes in the characteristic features and excreted urine amount are of primary importance in care of the patients with renal diseases. A patient himself or medical personnel should daily determine diuresis and register it in a temperature chart in figures (in ml). All the consumed liquid should be taken into account, liquid taken with drugs, soup, tea, and juice etc., parenterally introduced as well. The collected diurnal urine is poured into a measure pot, an amount of excreted liquid is measured and compared with that of taken up, the prevalence being assessed. If the amount of taken up liquid predominates, diuresis is considered to be negative, and if the amount of excreted liquid predominates or the indices are equal – diuresis is positive.

Patients with urination disorders require much attention. A bed mattress for a patient, suffering from urinary incontinence, is first covered with an oilcloth and only then with a sheet. The skin is carefully washed with baby soap; hands, feet, physiological folds are oiled with a baby cream. In severe cases bed sore prevention is carried out and keeping to a strict diet is under observation.

Urine taking for the laboratory examination

A morning urine portion, taken after a careful toilet of external genital organs is used for a total urinalysis. 100-200 ml of urine is collected into a dry clean vessel and delivered to the laboratory not later than 1-1,5 hours after collection. In heavy patients or in women during menstruation period (if it is necessary) urine is taken for urinalysis by means of a catheter. Colour, transparency, smell, reaction, relative density is determined in total urinalysis performance. Examination of urinary relative density performed in three-hour portions during a day assesses the renal concentrating function (Zimnitsky test). Chemical urinalysis reveals protein presence, sugar, ketone bodies, bilirubin, urobilin and mineral substances. Leukocytes, erythrocytes, cylinders, epitheliocytes, crystals and salt amorphous masses in urinal sediment microscopy can be revealed.

Methods of urinal examination according to Kakovsky-Addis (concrete time – 24 hours) and Nechiporenko (concrete urine volume –

1 ml) refer to the quantitative (standardized) methods of formative elements detection in the urine.

In urinal examination according to *Kakovsky-Addis* urine is collected into separate containers during 24 hours. In order to prevent urinary formed elements destruction, occurring in long urinary stasis and caused by microorganisms (pH shifts to alkaline side), preservation agents are added into a container (4-5 drops of formaldehyde or 10 ml of carbolic acid). The container with urine should be kept in a refrigerator for a day. If there is no possibility to follow this requirement, urine is collected for a 10-hours' period. In this case a patient empties the urinary bladder at 22 o'clock (this urine is poured out). For the following 10 hours a patient does not urinate, but at 8 AM he urinates into a clean container and it is taken to a laboratory. A portion, received for 12 minutes (1/50 of the whole urinal volume) is taken from the total amount of urine. 24 hours' amount of formed elements is counted. Less than 1-2 millions of erythrocytes, less than 2-4 millions of leukocytes and less than 20 thousand of cylinders are normally excreted for 24 hours.

Nechiporenko method is more widely used since technically it's simpler – "a middle portion" of the urinal morning stream should be taken for analysis. The final calculation expressed in terms of a number of cells per 1 ml of urine is performed. 1 ml of healthy urine contains less than 2000 of erythrocytes, less than 4000 of leukocytes and less than 20 (0-1 cylinder calculated for 4 cameras) hyaline cylinders. 2-3 ml of urine is enough for a test, but a nurse should clearly explain, how the urine should be collected in this case.

Bacteriological examination of urine is carried out in kidneys and urinary tract infectious inflammatory diseases (pyelonephritis, urethritis, cystitis, etc): 10 ml of urine in a sterile test-tube is taken to a bacteriological laboratory to be cultured on a special nutrient medium.

To determine diurnal proteinuria or glucosuria the urine is collected into a 3 l container during a day from 8 AM till 8 AM of the next day, which is kept in a cool place. A total amount of urine is measured; 200 ml is taken to a laboratory.

*Preparing a patient for the kidneys and urinary tract
roentgenological examination*

In roentgenological examination the survey kidney and urinary tract roentgenography and excretory urography are often performed, when a contrast substance excreted by the kidneys is introduced intravenously.

Preparation includes a residue-free diet kept by a patient for 3 days before the examination and exclusion of the products rich in cellulose. At night on the eve of the examination and 2 hours before the procedure in the morning a cleansing enema is given. After an enema a patient is recommended to move. The study is carried out on an empty stomach.

PRACTICAL SKILLS

*Urine collection for a total analysis and for an analysis
according to Nechiporenko*

1. After a careful washing of genitourinary organs is performed, a patient directs his first portion of the urinal morning stream into a bed-pan or a water-closet pan, a middle portion of the urinary stream (the examined one) is directed into an urine collecting container while the last portion is excreted into a bed-pan or a water-closet pan.

2. A patient himself or a nurse pours the urine into a container and tightly covers it with a lid; he (she) sticks a label with a patient's name and a ward number on the container.

3. Urine should be delivered to a laboratory not later than an hour after its collection.

*Urine collection for examination according to Zimnitsky method
(for the examination of the renal functional state)*

1. A patient is given 8 numbered containers indicating a portion's number and the time of the urinal collection.

2. At 6 AM a patient urinates into a water-closet pan, then every 3 hours, including night, he urinates into corresponding containers till 6 AM of the next day.

3. Containers should be tightly closed and delivered to a laboratory.

Excretory urography

1. To inform a patient about the appointed examination at least 2 days beforehand and to check his keeping a diet.

2. To do a cleansing enema with warm water on the eve of the examination.

3. To do a new cleansing enema in the morning, 2 hours before the examination.

4. The examination is performed strictly on an empty stomach in a roentgenological room; the roentgenocontrast substance (urographin and others) is introduced intravenously to a patient in a horizontal position.

CONTROL QUESTIONS

- 1) Anatomy and physiology of the urinary system.
- 2) Main symptoms of kidneys and urinary tract diseases.
- 3) Urgent conditions in kidneys and urinary tract diseases.
- 4) Care of the patients with urination diseases.
- 5) Urine taking for laboratory examination.
- 6) What is determined in total urinalysis?
- 7) Urinalysis method according to Kakovsky-Addis.
- 8) Urinalysis method according to Nechiporenko.
- 9) Significance of urine examination according to Zimnitsky.
- 10) Roentgenological methods of kidneys and urinary tract examination.

UNIT 7

**Theme 2. NURSING THE PATIENTS IN POOR CONDITION.
NOTION OF TERMINAL STATES AND RESUSCITATION.
RESUSCITATION ACTIONS**

Goal: to get a notion about the main methods of care of the seriously ill patients, terminal states, resuscitating actions, biological death verification; to master skills.

Knowledge objectives:

- to know peculiarities of care of seriously ill patients, peculiarities of observation over their activities of daily living (ADL); methods of resuscitation; rules of a cadaver treating.

Skill objectives:

- to develop skills of bed sore prevention, care of an oral cavity, performing of mouth to mouth and mouth to nose artificial ventilation, closed cardiac massage.

Subject-matter:

1. Peculiarities of taking care of patients in serious and critical conditions.

2. Conception of resuscitation and work of intensive care unit.

3. Care of skin and bed sore prevention.

4. First pre-medical aid for seriously ill and agonizing patients.

5. Rules of a cadaver treating.

Equipment required: a moulage, Ambu apparatus (Ambu resuscitator), oral and nasal artificial airways, disinfectant liquid, a bed-pan, an under-laying rubber circle, a container for collecting of urine, forceps, a clamp, droppers, a Janet's syringe, rubber sterile gloves, a mask, gauze, cotton tampons, a towel, an oil-cloth bedding.

EDUCATIONAL MATERIAL

Diseases of various organs and systems may lead to a patient's serious condition. Various positions of a patient are marked. Patients in satisfactory condition are known to take an active position, when free movements are easily performed. To relieve his sufferings a patient takes forced position. A vivid example is a patient's sitting position with lowered legs in cardiac dyspnea. In such position blood redistribution with its deposition in the lower extremities and decrease of congestion in the pulmonary circulation occur leading dyspnea weakening. In unconscious state or acute weakness, when active movements are impossible, position of a patient is passive.

Bed making as well as a control of its condition has a great importance. Mattresses of seriously ill patients with feces and urine incontinence are covered with a medical oilcloth. A bed sheet is carefully straightened; edges are tucked under a mattress. Change of

bed-linen and underwear is carried out once in 10 days, and more frequently if necessary. Seriously ill patients perform activities of daily living in lying position. In such cases patients are given bedpans or urinals. After emptying a bedpan is thoroughly washed with hot water and disinfected in 1-2% lime chloride solution or 3% chloramine solution.

Proper care of skin is especially important for patients confined to bed. Skin soiling leads to itching, secondary dermatic infection, development of fungous disease and decubital formation. Bedsores are formed in those areas where muscular tissue is badly developed or absent, i.e. in the area of sacrum, coccyx, malleolus, condyles and trochanters of hips. Occurrence of bedsores is caused by an offhand care of skin, irregular change of bed-linen, insufficient activation of a patient, etc. Decubitus passes some stages of development: paleness, reddening of skin, formation of bubbles, and epidermal exfoliation development of necrosis of skin, subcutaneous fat, fascias and tendons. Decubital complication followed by secondary purulent or putrefactive infection may occur.

Prophylaxis of bedsores consists in constant control of bed condition, underwear of a seriously ill patient, timely elimination and smoothing of pleats. In preventive purposes special under-laying rubber circles placed under areas of the body, exposed to long pressure (for example, under the sacrum) are used. The circle should be slightly inflated so that it could change a form in patient movement. It is necessary to change regularly a patient position, turning him in bed 8-10 times a day. Decubital treatment in initial stages is carried out by moistening the injured areas with 5-10% iodine solution, 1% brilliant green solution. Decubital surface is covered with an aseptic bandage. Salve dressings, general stimulating medication and even surgical treatment in some cases are used.

Patients take a hygienic bath or shower not less than once a week in cases of absence of contraindications. Greasy hair should be washed once a week, dry and normal hair - once in 10 days. Skin of seriously ill patients is daily wiped with cotton tampons soaked in boiled water with addition of alcohol or eau-de-cologne. Hands are washed before every meal, and feet - 2-3 times a week. Genital integuments and perineum should be washed daily with warm water or weak solution of potassium

permanganate, using cotton tampons. It is also necessary (not less than once a week) to trim nails short, removing mud under them.

Care of the eyes is carried out in case of secretions, sticking eyelashes and eyelids together. By a cotton tampon, soaked in 2% boric acid solution, first soften and remove crusts, then wash out conjunctiva with boiled water or with physiological salt solution. Patients should clean the teeth not less than twice a day and gargle the mouth after every meal. Oral cavity of seriously ill patients is washed with the help of Janet's syringe or rubber cylinder with 0,5% sodium bicarbonate solution, physiological salt solution or weak solution of potassium permanganate. For order of liquid not to get into the respiratory tracts, a patient is given a semi-sitting position with the head tilted forward. If a patient is in bed, the head is turned awry. An angle of the mouth is pulled with a spatula back for the best outflow of liquid.

Conception of reanimation and work of intensive care unit

A section of clinical medicine studying various aspects of resuscitation of an organism and working out methods of treatment and prevention of terminal states is called reanimatology. Resuscitation is carried out in many diseases and conditions: sudden cardiac arrest (acute myocardial infarction, electrotrauma, etc.), sudden respiratory arrest (a foreign body in the trachea, drowning, etc.), poisoning, serious traumas, loss of blood, acute renal and hepatic failure, etc. Resuscitation of patients is not carried out, if there are damages of vital organs of irreversible character, if all compensatory forces of an organism are exhausted (a patient is in the final incurable stage of a disease).

Conditions on the borderline between life and death are called terminal. Process of dying includes several stages:

1. The pre-agonal condition arises against the background of severe hypoxia of internal organs and is characterized by gradual loss of consciousness, respiratory and circulatory disturbances. Pre-agonal period ends with a terminal pause (the short-term arrest of respiration) from 5-10 seconds to 3-4 minutes.
2. Agony (Greek agonia - struggle). An agony is a stage of the process of dying, previous to clinical death and characterized by

excitation of centers of medulla oblongata. Agony is characterized by short-term rising of arterial pressure and frequency of respiration, sometimes short restoration of consciousness is even possible. One of the clinical signs of agony is the so-called agonal respiration with infrequent respiratory motions - short, deep, convulsive. Then sharp drop of BP, decrease of frequency of cardiac contractions, respiratory depression, and loss of consciousness are observed. Pain response and reflexes disappear, pupils extend, and involuntary urination and defecation happens, body temperature reduces.

3. Clinical death is a reversible stage of dying with 5-6 minute duration at which external manifestations of organism vital activity disappear, but irreversible changes in organs and tissues do not yet occur (metabolic processes in tissues proceed). With the help of resuscitating actions it is possible to restore vital activity of an organism completely.

Signs of clinical death:

- 1) unconsciousness (loss of consciousness usually occurs in 10-15 seconds after cessation of circulation);
 - 2) absence of reaction on external irritation;
 - 3) absence of reaction of pupils on light (at opening of an eyelid by a doctor a pupil remains wide, "fills" practically all the eye iris); dilatation of pupils with the loss of reaction on light begins in 40-60 seconds after cessation of circulation, maximal dilatation occurs in 90-100 seconds;
 - 4) respiratory arrest or infrequent superficial respiration (decreasing of respiratory movements up to 5-8 per minute);
 - 5) absence of pulse on radial, carotid, and femoral arteries;
 - 6) appearance of cyanosis of lips, finger tips, lobules of ears;
 - 7) pallor of integuments with mottled cyanosis development.
4. Biologic death. Biologic death is a condition of an organism, at which it's already impossible to reach complete restoration of functions of various organs (cerebral cortex first of all).

Signs of biologic death:

- 1) absence of spontaneous movements;
- 2) arrest of respiration and palpitation;
- 3) maximal dilatation of pupils, absence of their reaction on light;
- 4) fall of body temperature (up to a level of ambient temperature);

5) appearance of cadaveric lividity;

6) appearance of cadaveric rigidity.

As it follows from the aforesaid, the first three signs actually refer to the signs of clinical death. The subsequent three signs are actual signs of biologic death. However these signs appear comparatively late. Thus the temperature of a corpse may remain rather high (at high temperature of the environment); in some cases rigor mortis may not occur. Therefore in practice at rendering resuscitation actions biologic death is stated on the basis of the consensus established nowadays by reanimatologists. The main reference point is a time factor: 5-6 minutes from cessation of circulation + 30 minutes of non-effective resuscitation actions.

Resuscitation actions are obviously, more effective, if they are carried out in specialized departments, where there is a specially trained personnel. Intensive care units are organized in large hospitals and intended for carrying out resuscitation of patients with various diseases and conditions; postoperative intensive care units are intended for observation and treatment of patients after the operations under narcosis; specialized intensive care units are created for patients with certain diseases (toxicology, cardio-resuscitation, etc.). In every ward of intensive care unit individual nursing stations are equipped with necessary agents for rendering emergency resuscitation help.

First pre-medical help

Resuscitation (reanimation) is started immediately. It consists of a closed cardiac massage and artificial ventilation. Resuscitation is carried out in case of clinical death. A patient is quickly put on a firm horizontal surface (usually on a floor).

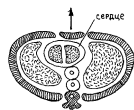
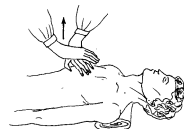
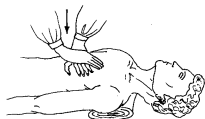
Artificial respiration (artificial pulmonary ventilation) is a replacement of air in patient's lungs, performed in an artificial way to maintain gas exchange in impossibility or failure of person's respiration. It is necessary to provide preliminary permeability of the respiratory tract achieved by "the tilt head/chin lift maneuver". A patient is laid down in a horizontal position on his back, thus the neck, the thorax and the stomach of a patient are released from clothes.

By the "mouth to mouth" method, the nose of a patient is closed, and exhalation is directed into the mouth of a patient, preliminary

having covered it with gauze or a handkerchief. It is necessary to open the mouth and the nose of a patient, there should follow a passive exhalation of a patient. At this time a person who renders help makes 1-2 normal inspirations himself. If it is impossible to open the mouth or "mouth to mouth" respiration is inefficient (thorax does not dilate), "mouth to nose" method is used. In "mouth to nose" method a person who renders help closes patient's mouth and after a deep inspiration makes a vigorous exhalation, clasping the patient's nose with his lips. It is necessary to note, that cardiopulmonary resuscitation is not recommended to interrupt for more than 5 seconds. A criterion of correct artificial respiration is lifting of the thorax at the moment of the artificial inspiration and audibility of going out air in passive exhalation. Artificial respiration is more preferable to be carried out with the help of Ambu bag (resuscitator) as well as using a special artificial airway (a dense rubber S-shaped tube with round panel in the middle). Artificial respiration is carried out with frequency of 16-20 per minute.

Closed cardiac massage is a rhythmical pressing of the heart between breast bone and backbone and creation of constant pressure differences in the thoracic cavity with the purpose of circulation restoration. 1-2 pressings on the breast bone should precede a massage which at presence of asystole can promote restoration of cardiac rhythm.

For closed cardiac massage a palm basis of one arm is put on the lower third of the third breast bone higher its xiphoid process by 2 fingers diameters, thus palmar long axis should coincide with the breast bone long axis (to reduce risk of rib fractures by sharp pressing of the breast bone), above it the palm of the second arm is placed. Fingers should not touch the thorax; both arms should be straightened in ulnar joints. Pressing on the breast bone is carried out by fast (for a second) fixing jerks with a subsequent removing of arms after every jerk (Fig. 19). The strength of pressing necessary to shift the breast bone towards the backbone by 4-5 cm is provided not only by the effort of arms, but also by the body mass of a person conducting a closed cardiac massage. Rate of a closed cardiac massage totals to 80-100 compressions per a minute.



Compression

The hands taking off

Fig. 19. Closed Cardiac massage.

If a closed cardiac massage is carried out simultaneously with the artificial respiration, then after 5 thorax compressions it is necessary to make 1 artificial inspiration. If closed cardiac massage and artificial respiration are carried out by one person, then after 15 compressions of thorax he makes 2 artificial inspirations.

Signs of efficiency of massage actions are pulse waves appearing on the carotid and miosis (narrowing) of the previously mydriatic pupils. Signs of the final efficiency of resuscitation, i.e. restoration of patient's cardiac activity, consist in the appearance of independent heart contractions (cardiac sounds and corresponding data at registration of ECG), pulse in the central and peripheral arteries, registration of BP (systolic BP at the level of 70 mmHg). The most frequent complication in closed cardiac massage is fracture of ribs and the breastbone (in old people they may be justified).

It is possible to interrupt the closed cardiac massage and artificial respiration only for a short period of time (for a few seconds) to assess the cardiac rhythm and carry out an electroimpulsive therapy (defibrillation) which, if it is possible, should be performed as soon as possible from the moment of the sudden cessation of circulation. If ECG reveals asystole, an electrocardiostimulation is performed with a special device.

It is necessary to know 2 important positions:

1. Without resuscitating actions in 3-4 minutes after cardiac arrest destruction of brain cells occurs;
2. If a closed cardiac massage is carried out without the appearance of cardiac self-contractions within 30 minutes, resuscitation is stopped.

Rules of a cadaver treating

Certification of biologic death is made by a doctor and a forensic pathologist basing upon some signs: cessation of respiration and

palpitation, maximal mydriatic pupils with the loss of their reaction on light, fall of body temperature, appearance of cadaveric lividity, cadaveric rigidity. A patient's death, date and exact time of death is fixed in a case history.

A cadaver is undressed, put on a special stretcher on its back with straightened legs, eyes are closed, the mandible is tied up, it is covered with a bed sheet and taken out to a sanitary room of a department for 2 hours (before occurrence of livores mortis). Only after that a nurse writes down on a femur of a cadaver its surname, initials, number of a case history. Things are given to relatives of a dead patient for receipt. All things from a bed of a dead person are sent to disinfection. A bed, a bedside-table are rinsed with 5% chloramine solution and a bedpan is put into a 5% chloramine solution.

Newly hospitalized people are not used to be laid on bed where a patient died for a day.

PRACTICAL SKILLS

Partial washing of a patient

1. To wash hands with soap, put on gloves.
2. To put an oilcloth with diaper under a patient.
3. To soak a napkin (a sponge) in water, wring it out, and sponge a patient's body in the following order: a) face, ears, neck; b) thorax; c) arms, inguinal region, perineum, stomach; d) hips, shins, feet.
4. To wipe a patient dry, for legs use another towel.
5. To cover a patient well.
6. To soak towels, napkins, an oilcloth in a disinfectant solution.

Prevention of decubital formation

1. To wash hands with soap, put on gloves.
2. To turn a patient on his side and to wash the skin with a soft napkin soaked in warm water or vinegar.
3. To dry up skin thoroughly, to massage those places where bedsores are more often formed, to grease skin with sterile vaseline (oil).
4. To lay under places of formation of decubiti gauze or rubber circles.
5. To change a position of a patient every 2 hours.
6. To examine places of frequent formation of decubiti.
7. To change wet and dirty linen immediately.
8. To check the changed bed linen and underwear, to be sure that there are no seams, patches and folds.

9. To treat the places of skin reddening with a weak solution of potassium permanganate.
10. To control cleanliness of a patient's body all the time.

Cardiopulmonary resuscitation (CPR)

Before starting CPR, assess the situation:

1. Is a patient conscious or unconscious?
2. If a patient appears unconscious, tap or shake his or her shoulder and ask loudly: "Are you OK?"
3. If a person doesn't respond, follow the steps below and call for help.

To perform CPR:

1. In order to check for the signs of life it is necessary to lay a person flat on his back on a firm surface with extended neck.
2. Open the patient's mouth and airway by lifting the chin forward.
3. Determine whether a patient is breathing by listening to breath sounds, feeling for air motion on a nurse's cheek and ear, and looking for chest motion.
4. If a patient is not breathing, pinch his or her nostrils closed, make a seal around the mouth and breathe into his or her mouth twice. Give one breath every five seconds - 12 breaths every minute. Nurse's lungs should be refilled completely after every breath.
5. If there are no signs of life - no response, movement or breathing - begin chest compressions. Nurse's hands are placed on the lower third of the breastbone higher its xiphoid process by 2 finger diameters, elbows are kept straight.
6. Push down at a rate of 80 to 100 times a minute. The pushing down and letting up phase of every cycle should be equal in duration. Don't jab down and relax. After 15 compressions, breathe into a person's mouth twice.
7. After every four cycles of 15 compressions and two breaths, recheck for signs of life. Continue the rescue maneuvers as long as there are no signs of life.

CONTROL THEMES FOR DISCUSSION

1. Peculiarities in the care of seriously ill patients.
2. Change of clothes and bed-linen of seriously ill patients.
3. Care of skin and mucous membranes of seriously ill patients.
4. Techniques of a closed cardiac massage.
5. Techniques of artificial ventilation.
6. Diagnosis of clinical death.
7. Certification of biological death.
8. Rules of a cadaver treating.