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КАФЕДРА ПРОПЕДВТИКИ ВНУТРЕННИХ БОЛЕЗНЕЙ

**МЕДИЦИНСКИЙ УХОД ЗА ПАЦИЕНТАМИ  
С ЗАБОЛЕВАНИЯМИ ОРГАНОВ ДЫХАНИЯ**

**MEDICAL CARE OF PATIENTS  
WITH RESPIRATORY DISEASES**

Учебно-методическое пособие



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**Медицинский** уход за пациентами с заболеваниями органов дыхания = *Medical care of patients with respiratory diseases* : учебно-методическое пособие / Г. М. Хващевская [и др.]. – Минск : БГМУ, 2023. – 42 с.

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Представлен материал для подготовки к занятию по изучению методов ухода за пациентами с патологией органов дыхания. Изложен перечень основных клинических признаков пульмонологических заболеваний, позволяющих студенту распознать нозологическую форму заболевания. Описаны методики ухода за пациентами с заболеваниями органов дыхания.

Предназначено для студентов 1-го и 2-го курсов медицинского факультета иностранных учащихся, обучающихся по специальности «Лечебное дело» на английском языке.

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## **EXPLANATORY NOTE (MOTIVATIONAL CHARACTERISTIC OF THEME)**

Every doctor in the course of his activity is faced with the diagnosis and treatment of patients with respiratory diseases, and a significant place in the success of treatment is adequately organized patient care. Nosological forms occur with different frequency in different regions of the world. The care program may differ both in different diseases and in different phases of the same disease. Carefully organized and properly carried out patient care provides positive dynamics during the course of the disease, accelerates recovery, maintains the stability of remission in chronic pathology; often the long-term prognosis for the patient depends on the quality of care.

This methodological guide describes the main complaints of respiratory diseases, Monitoring the nature of breathing, cough and sputum secreted. Rules for the use of an individual spittoon. Giving the patient a drainage position. Measurement of body temperature, evaluation of the result. Registration in medical documentation. Medical care for patients with chest pain, shortness of breath, suffocation, asphyxia, hemoptysis and pulmonary bleeding. Rules for using the picflowmeter. Oxygen therapy for respiratory diseases. Features of medical care for patients with respiratory diseases. Medical care and supervision of elderly and senile patients with respiratory diseases.

### **THE MAIN COMPLAINTS OF PATIENTS WITH RESPIRATORY DISEASES**

Complaints of patients with respiratory diseases are conditionally divided into the main ones, i. e. those directly related to respiratory diseases and additional or general complaints.

The main complaints include shortness of breath, cough without or with sputum, hemoptysis and chest pain. Additional complaints include malaise, weakness, irritability, fever, sweating, decreased appetite, increased fatigue and others.

Dyspnea (dyspnoe) is characterized by a combination of a feeling of difficulty breathing with a change in its frequency, depth and rhythm.

Depending on the cause and conditions of occurrence, shortness of breath can be physiological and pathological. Physiological dyspnea occurs in healthy individuals with significant physical and emotional stress, staying in high-altitude conditions, being in a hot and stuffy room, etc.

The mechanism of shortness of breath is associated with the excitation of the respiratory center by excess carbon dioxide and various under-oxidized products that accumulate in the blood and brain matter with insufficient oxygen supply to the body through the lungs.

Shortness of breath in respiratory diseases is most often caused by a violation of the function of external respiration. The cause of shortness of breath can be diseases and pathological conditions of the bronchopulmonary system, leading to a violation of the patency of the respiratory tract: a tumor, a foreign body, a spasm of smooth muscles or inflammatory edema of the bronchial mucosa. Dyspnea is also caused by pathological processes that cause a decrease in the respiratory surface and elasticity of the lungs (compression of the lung with the accumulation of air or fluid in the pleural cavity, a decrease in the elasticity of the lungs with emphysema, compaction of a part of the lung with inflammation, infarction, atelectasis, etc.). In addition, dyspnea can be caused by alveolar-capillary blockade, due to inflammation of the walls of the pulmonary arterioles and capillaries, exudative-proliferative inflammation of the interalveolar tissue (with viral pneumonia, interstitial lung diseases, pulmonary edema, etc.).

Depending on which phase of breathing is difficult, there are three types of shortness of breath: inspiratory, expiratory and mixed.

Inspiratory dyspnea is characterized by difficulty in breathing, and is observed with a mechanical obstacle to the entry of air into large airways (in the pharynx, larynx, trachea, large bronchi). With a significant narrowing of the larynx, trachea or bronchus of the first order (tumor, foreign body, swelling of the vocal cords), the inhalation becomes loud, noisy, audible at a distance (the sound of air suction — stridor — stridorous breathing).

Expiratory dyspnea consists in difficulty in exhaling, which is performed slowly, sometimes with a whistle. It is observed with narrowing of the small bronchi and bronchioles due to inflammatory edema and swelling of the mucous membrane or with spasm of their smooth muscles (bronchial asthma). These factors interfere with the normal movement of air from the alveoli and complicate the exhalation phase.

With mixed shortness of breath, both inhalation and exhalation are difficult and, almost always, there is an increase in breathing. This form of shortness of breath is observed in many lung diseases that cause a decrease in the respiratory surface (extensive pneumonia, compression of the lung with liquid or air, etc.), while shortness of breath may be temporary (pneumonia, pleurisy) or permanent (emphysema of the lungs).

## OBSERVATION OF THE NATURE OF BREATHING

Observing the breathing, it is necessary to determine the frequency, depth, rhythm of respiratory movements and evaluate the type of breathing.

The frequency of respiratory movements (BDD) is the number of respiratory movements in 1 minute; one respiratory movement is considered to be the combination of inhalation and exhalation following it. The BPD in an adult at rest is 16–20 per minute, in women 2–4 breaths more than in men (in newborns, the BPD is 40–45). In the vertical position, the BDD increases (18–20), in the «lying down» position it decreases (up to 14–16 per minute), in sleep it decreases to 12–14 per minute. In trained people and athletes, the frequency of respiratory movements can decrease and reach 6–8 per minute.

In depth, breathing can be shallow, moderate depth and deep (depends on the volume of inhaled air). Factors leading to increased heart contractions can cause an increase in depth and increased breathing. These are physical exertion, an increase in body temperature, a strong emotional experience, pain, blood loss, etc. The rhythm is determined by the intervals between breaths. Normally, the respiratory movements are rhythmic. In pathological processes, breathing is irregular. Types of breathing: thoracic, abdominal (diaphragmatic) and mixed.

Observation of breathing should be carried out imperceptibly for the patient, since he can arbitrarily change the frequency, depth, rhythm of breathing. You can tell the patient that you are examining his pulse.

Determination of the frequency, depth, and rhythm of breathing (in a hospital setting).

Equipment: watch or stopwatch, temperature sheet, hand, paper.

Sequence of actions:

1. To warn the patient that a pulse examination will be conducted (do not inform the patient that BDD will be examined).
2. Wash your hands.
3. Ask the patient to sit comfortably (lie down) in order to see the upper part of his chest and (or) abdomen.
4. Take the patient's hand so as to study the pulse, but to watch the tour of his chest and count the respiratory motion for 30 s. then multiply the result by 2.
5. If you are unable to watch the excursion of the chest, then place your hands (and your patient) chest (in women) or epigastric region (men), simulating the study of the pulse (while continuing to hold the hand by the wrist).
6. Record the results in a temperature sheet.
7. Wash your hands.

The frequency of respiratory movements is marked graphically in the temperature sheet in yellow (fig. 1)

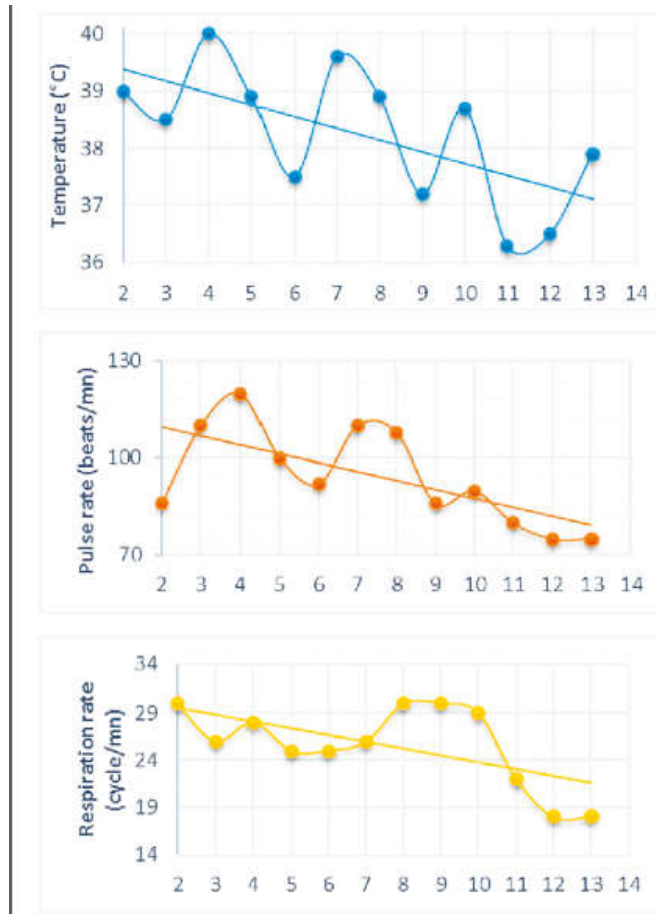


Fig. 1. The frequency of respiratory movements is marked graphically in the temperature sheet in yellow

## OBSERVATION OF THE NATURE OF COUGH

**Cough** (tussis) — is an arbitrary or involuntary sharp jolt-like forced sonorous exhalation (aimed at clearing the airways of mucus, pus, blood, dust, foreign bodies). The beginning of exhalation occurs when the glottis is closed, as a result of which the pressure in the trachea and bronchi sharply increases. Thus, a cough push is like an air shot through a narrowed glottis. Cough is a complex reflex act, the most common cause of which is irritation of cough receptors located in the mucous membrane of various parts of the respiratory tract, especially the larynx, trachea, bronchi (mainly in the tracheal bifurcation zone and branches of large bronchi), as well as in pleural leaflets. Irritation of cough receptors can be caused by the following various factors:

1) chemical — inhalation of vapors of various acids, alkalis, toxic substances, etc.;

2) mechanical — ingress of dust, small particles into the respiratory tract, compression of the larynx and bronchi by a tumor, enlarged lymph nodes or thyroid gland, etc.;

3) thermal — inhalation of very cold or very hot air;

4) inflammatory changes in the respiratory tract.

When assessing a cough, attention should be paid to its nature, rhythm, duration, time and conditions or circumstances of its occurrence, volume and timbre and body position.

According to the rhythm, three forms of cough can be distinguished:

1) cough in the form of separate coughing jerks, the so-called coughing, is observed with laryngitis, tracheobronchitis, often in smokers, with initial forms of tuberculosis, sometimes in nervous people;

2) cough in the form of a series of consecutive coughing jerks, repeated with some intervals, pulmonary-bronchial cough;

3) paroxysmal cough is observed when a foreign body enters the respiratory tract, with whooping cough, with bronchial asthma, with pulmonary cavities (cavities), with damage to bronchial lymph nodes.

According to the timbre of the cough, several forms can also be distinguished:

1) a short and cautious cough, usually accompanied by a painful grimace, is observed with dry pleurisy and at the beginning of croup pneumonia;

2) barking cough — with swelling of the false vocal cords;

3) hoarse cough — with inflammation of the vocal cords;

4) silent cough — with ulceration of the vocal cords, their edema, with sharp general weakness.

By its nature, the cough is divided into:

1) dry (cough without sputum);

2) wet (cough with sputum).

**Hemoptysis** is a symptom characterized by the release of sputum with an admixture of blood during coughing and has great clinical significance. In the Russian medical literature, the terms «haemoptoe» and «haemoptysis» are found to denote this symptom. However, most authors use the term «haemoptoe» to mean pulmonary bleeding, i. e. the release of pure scarlet blood, blood clots or intensely bloody sputum when coughing, and the term «haemoptysis» — hemoptysis — coughing up sputum with tinted blood or containing streaks of blood. Usually, pulmonary hemorrhage is considered to be the release of more than 50 ml of blood per day when coughing, and the release of blood in an amount of up to 50 ml is considered hemoptysis. With the release of more than 200 ml of blood per day, they talk about massive pulmonary bleeding. In case of hemoptysis, it is necessary to find out its cause, the amount and color of the blood secreted with cough. The most common cause of the appearance of blood in sputum are various diseases and injuries of the lungs, airways, as well as some diseases of the cardiovascular system. When a patient has hemoptysis, it should not be forgotten that the latter can often be as a result of blood impurities in sputum from bleeding gums, nasopharyngeal mucosa, nosebleeds, telangiectasia.

**Pain** (dolor) in the chest can vary in its origin, localization, nature, intensity, duration and irradiation: in connection with the act of breathing, coughing, movement and position of the trunk.

Depending on the causes of occurrence, the following pains are distinguished:

- 1) related to the lesion of the chest itself;
- 2) caused by diseases of the lungs and pleura;
- 3) associated with pathological processes in the heart or aorta;
- 4) caused by irradiation into the chest of pain in the pathology of the abdominal cavity, spine, etc. (reflected pains).

*Additional complaints.* In addition to the above main complaints, patients with respiratory diseases can make a number of general complaints: malaise, weakness, sweating, fever, fatigue, etc.

## **OBSERVATION OF THE NATURE OF SPUTUM SECRETED**

**Sputum** is usually a pathological secret of the trachea and bronchi, released when expectorating or coughing in a patient.

In a healthy person, it is possible to separate light sputum (mucus) in a small amount mainly in the morning, usually without concomitant cough during expectoration. During the day, no more than 100–150 ml of mucus is formed in a healthy non-smoker. Mucus is moved by the cells of the ciliated epithelium upwards (into the large bronchi, into the trachea and larynx); then it enters the pharynx and can be swallowed. The movement of mucus from the larynx to the pharynx is helped by a slight barely noticeable coughing.

The composition of sputum as a pathological discharge may include mucus, serous fluid, saliva, the contents of the nose and sinuses, blood and respiratory tract cells, atypical tumor cells, bacteria, less often helminths and their eggs. Sputum analysis allows you to establish or assume the nature of the pathological process in the respiratory organs, often — to establish its cause.

Medical personnel conducting surveillance and providing medical care need to distinguish between types of sputum — mucous, purulent, putrefactive, serous, «vitreous», «rusty», bloody. It is necessary to monitor the amount of sputum being separated, the time and frequency of separation during the day, its color; specify the presence of a putrid smell of sputum, the content of impurities.

Assistance to the patient during sputum separation. If the patient has sputum, the nurse must provide him with a special container for temporary collection of sputum — a spittoon and then monitor the timely emptying of spittoons and cleanliness.



In addition, a nurse is obliged, observing ethical principles, to teach a patient separating sputum the rules of behavior in order to prevent infection of others:

1) convince the patient not to cough in close proximity to healthy people (if possible) or turn away when coughing; such a measure is advisable even with a dry cough;

2) show how to cover your mouth with a handkerchief, napkin or hand when coughing; explain to the patient that it is impossible to spit sputum on the floor, since, when drying, it can turn into dust particles, rise into the air and become a source of infection for other patients and staff;

3) suggest that a patient with prolonged or chronic sputum separation in a hospital and at home collect sputum in a spittoon that closes with a tight lid; moreover, a small amount of disinfectant solution (for example, 0.3% Chlorocide solution) should be poured into the bottom of the vessel;

Individual spittoons are used for respiratory diseases with sputum discharge and for collecting it for research.

Rules for the use of an individual spittoon:

1. It is necessary to explain to the patient the rules for using the spittoon.

2. Give him a dry, clean spittoon with a tight lid.

3. Fill the sputum by  $\frac{1}{4}$  volume with a 3-solution of chloramine, in case of tuberculosis pathology — with a 5-solution of chloramine.

4. After disinfection, drain the sputum into the sewer, and burn the sputum from tuberculosis patients with sawdust in a special oven.

5. Disinfect the used spittoons in a 3-solution of chloramine for 1 hour. If a tuberculosis patient used the spittoon, the treatment is carried out with a 5-solution of chloramine for 4 hours.

6. Then the spittoon should be rinsed with running water. Store in a clean, dry form in a specially designated place.

## **THE TECHNIQUE OF COLLECTING SPUTUM FOR LABORATORY TESTING**

In clinical practice, several sputum tests are used: general sputum analysis, sputum examination for flora, for the sensitivity of flora to antibiotics, several variants of research for Koch bacilli (mycobacterium tuberculosis), sputum examination for the presence of atypical cells, etc. The technique of sputum collection for different purposes may differ. Preparation of the patient for sputum collection and provision of the necessary conditions for collection and storage is carried out by a nurse. The delivery of sputum to the laboratory from the sanitary room or from the ward is carried out by a junior nurse or nurse. Errors in the sputum sampling technique, as a rule, complicate the accuracy and timeliness of diagnosis.

**Sputum collection for general analysis** is usually performed by obtaining morning sputum; it is possible to collect the daily volume of sputum. In the morning, sputum is collected before the first meal. The patient is offered to thoroughly brush his teeth and rinse his mouth. They explain that sputum is needed for the analysis (not saliva and not the discharge of the nasal sinuses). They suggest breathing deeply and coughing slightly, which contributes to the release of sputum. 3–5 ml of sputum is sufficient for general sputum analysis. Sputum for general analysis should be collected in a clean (not sterile) dry graduated spittoon with a screw cap; a label must be glued to the container: indicate the surname, first name and patronymic of the patient, the name of the sending department, the dates of the analysis and the purpose of the study, i.e. the name of the sputum analysis).

Sometimes sputum is almost not released; and if its examination is extremely necessary to clarify the diagnosis, then it is recommended to use methods of provocation of sputum separation. After the standard morning preparation for sputum analysis, the patient is inhaled with a 15 % sodium chloride solution prepared with a 2 % sodium bicarbonate solution.

If, however, fresh sputum is not received in the morning, it is possible to leave the sputum collection container to the patient for a while and send the daily amount of sputum for analysis. The option of daily collection of sputum with subsequent analysis is possible when patients complain of hemoptysis, which is not recorded objectively by a doctor or medical staff.

Sometimes, with the formation of a sufficient amount of sputum, patients are not able to cough it up, but can only swallow the discharge. Under such conditions, an ENT doctor under visual supervision can take a sputum sample from the vocal cords for analysis. It is also possible to take bronchial flushing waters for analysis by an endoscopy, where also under the control of a laryngeal mirror, with the help of a laryngeal syringe, pours several milliliters of sterile isotonic solution into the trachea on inspiration; after such a procedure, coughing up sputum from the bronchi and trachea is facilitated; the nurse collects the contents in sterile dishes.

The treatment of spittoons is an important event for the care of patients separating sputum. To disinfect sputum, the spittoon is  $\frac{1}{3}$  filled with a 2 % chloramine solution; and for tuberculosis patients, a 5 % chloramine solution is used. Sputum after disinfection is drained into the sewer network; sputum collected from tuberculosis patients is mixed with sawdust and burned in special furnaces. Spittoons should be emptied daily, after noting the amount of sputum per day in the temperature sheet. Before emptying, it is necessary to inspect the sputum: if blood streaks appear in it, the attending (or duty) doctor should be informed immediately. After application to patients, the spittoon is disinfected in a 3% solution of chloramine (exposure 60 minutes), or 0.3% solution of «Chlorocide» or 0.3% solution of «Chlorodez» (exposure 180 minutes) or 0.3% Chloromix solution (180 minutes exposure). After the use of spittoons by tuberculosis patients, disinfection

of containers is carried out with a 5 % chloramine solution (exposure 240 minutes). After that, the spittoon is washed with running water, dried and put on a shelf to store clean spittoons.

Taking sputum for research on *Mycobacterium tuberculosis* may have some features. The screening version of the study is included in the general sputum analysis; in this case, a standard sputum collection is carried out for general analysis. However, if it is planned to sow on special media for the subsequent production of colonies, then sputum is collected in a sterile spittoon.

The detection of *mycobacterium tuberculosis* using the flotation method is required in cases where it is not possible to detect them using a general sputum analysis; this happens even with obvious clinical manifestations of tuberculosis. In such cases, a special sputum study is required with the «enrichment» of the studied volume of sputum with mycobacteria; the flotation — surfacing method is used. Careful collection of sputum for the flotation method has features: it is collected in sterile dishes for 2–3 days (the volume should be at least 100 ml, there are more mycobacteria in it) and stored in a technical refrigerator. The technique is complicated: in order to dissolve the lumps of mucus and homogenize sputum in the laboratory, it is poured into a narrow-necked container with a volume of 200 ml, an equal amount of 0.5% NaOH solution is added, shaken and kept in a water bath at a temperature of 55–56 °C. 1–1.5 ml of gasoline and up to 200 ml of distilled water are added to the resulting composition, shaken, allowed to settle. Gasoline floats up and collects in the neck of the bottle, dragging Koch's bacilli with it. This top layer is removed with a pipette one drop at a time and layered on a warm slide. After special coloring (according to Cil-Nielsen), the drug is examined under a microscope.

For more reliable detection of tubercle bacilli, the method of luminescent microscopy is used, in which the prepared smears are additionally coated with a luminescent composition, which greatly facilitates the detection of brightly glowing tubercle bacilli on a blue background.

Taking sputum for examination for tumor (atypical) cells also has a feature: after the morning standard preparation, freshly extracted sputum is collected in a clean spittoon or bottle and sent to the laboratory immediately, since atypical cells are rapidly destroyed.

Taking sputum for studies on flora and on the sensitivity of microflora to antibiotics. On the eve of the study, the nurse receives a sterile spittoon or a sterile Petri dish in the bacteriological laboratory. The standard preparation for sputum analysis is explained to the patient and its careful implementation is monitored. However, the first portion of sputum is not collected in a sterile spittoon, but is spat out. The subsequent sputum is released into a sterile spittoon (the patient is warned beforehand not to touch the edges of the dishes with his hands or mouth), closed with a lid and quickly delivered to the laboratory.

## HELPING A PATIENT WITH A COUGH REQUIRES

Helping a patient with a cough requires, first of all, the treatment of the underlying disease. To relieve the condition with a dry cough — to stimulate the sputum separation — steam inhalations are used (from Lat. «inhalatum» — inhalation); currently, the procedure is carried out using special equipment — inhalers, and with the addition of various medicinal substances to the inhaled liquid. To facilitate the formation of sputum and soften the coughing act, a plentiful warm alkaline drink is prescribed — for example, alkaline mineral water diluted with hot milk by half.

Steam inhalations are also prescribed to facilitate the discharge of sputum necessary for laboratory testing, in cases where sputum is coughed up a little, and it is difficult to get it.

For steam inhalations, a standard portable inhaler is used. It can be used to inject volatile substances into the respiratory tract, for example, essential oils. The water in the tank is heated to a boil, a rapidly expanding steam is formed. Going outside, the steam carries the drug in the form of aerosol particles, which are fed through the tube into the patient's respiratory tract; the duration of the procedure is 10–15 minutes. Regulate the temperature of the steam, which should have 50–60 °C at the outlet of the device. The procedures contribute to the intensification of blood flow and metabolism in the mucous and submucosal layers; enhance mucus secretion and cell regeneration; they contribute to the prevention of atrophy of the mucous membranes of the upper respiratory tract: essential oils, distributed on them in a thin layer, protect them from irritations arising from coughing and breathing.

A certain disadvantage of steam inhalers is the low concentration of the medicinal substance in the steam. In addition, large particles are formed, settling mainly in the upper respiratory tract and large bronchi.

Therefore, special compressors have been created for carrying out heat-and-moisture inhalations, which spray a medicinal aerosol heated to 38–42 °C with compressed air. The compressor is especially effective for frequent unproductive coughing. Modern devices — nebulizers — use ultrasound to disperse the therapeutic solution into aerosol microparticles reaching the small bronchi. The therapeutic effect of such inhalations consists in stimulating secretion (mucokinetic) and dilution of sputum (mucolytic).

Steam and heat-moist inhalations are contraindicated in case of hemoptysis, active tuberculosis of the respiratory tract, severe pneumonia, exudative pleurisy; they are not carried out in severely weakened patients or in a serious condition of the patient.

## GIVING THE PATIENT A DRAINAGE POSITION

For optimal sputum discharge, it is necessary to help the patient find a body position in which sputum discharge is facilitated. In this case, the effect of gravity and a certain rotation of the sputum-carrying airways are used through a change in body position; sputum passively flows away. This position of the body is called drainage or postural drainage (the term comes from Lat. «postura» — position; from the English «drain» — to drain, drain). A specially trained nurse selects the optimal drainage position for the patient, trains the patient and ensures that he regularly takes it several times a day and maintains it for 20–30 minutes (unless the doctor has indicated a different time). If necessary, a nurse provides assistance during each procedure. The technique can be used for bronchitis, pneumonia of various localization, lung abscess, bronchoectatic disease, etc.

It should be remembered that before each procedure (it is assumed that it will be effective), it is necessary to prepare an individual spittoon and fill the sputum container with a third of its volume with a disinfectant solution (0.3% Chlorocide solution or 0.3% Chlorodez solution or 0.3% Chloromix solution). The spittoon is placed next to the patient so that it is easy for him to use it.

Options for providing the patient with a drainage position:

1. The patient is offered to lie alternately on the right, then on the left side, hanging his head and hands off the bed (the «search for slippers under the bed» pose); each position should be taken 6–8 times in one procedure.

Explain to the patient that the procedure should be carried out 5–6 times during the day.

2. The patient is offered to lie on his back and is gradually rotated 360 degrees around the axis of his body. Turning the patient from the starting position, they suspend movement at every 45, ask him to take a deep breath and, when a cough appears, give him the opportunity to cough well. The patient is explained the sequence of the procedure and offered to take part in changing the position of the body.

The procedure must be repeated 3–6 times at one time; perform several procedures during the day.

3. The patient is offered to kneel (for example, on a soft mat — provided that strict bed rest is excluded) and lean deeply forward with support on his elbows, i. e. take the so-called knee-elbow position. The patient is asked to repeat the slope 6–8 times, after which to pause for 1 min, then repeat the slope 6–8 times again. The procedure includes no more than 6 cycles.

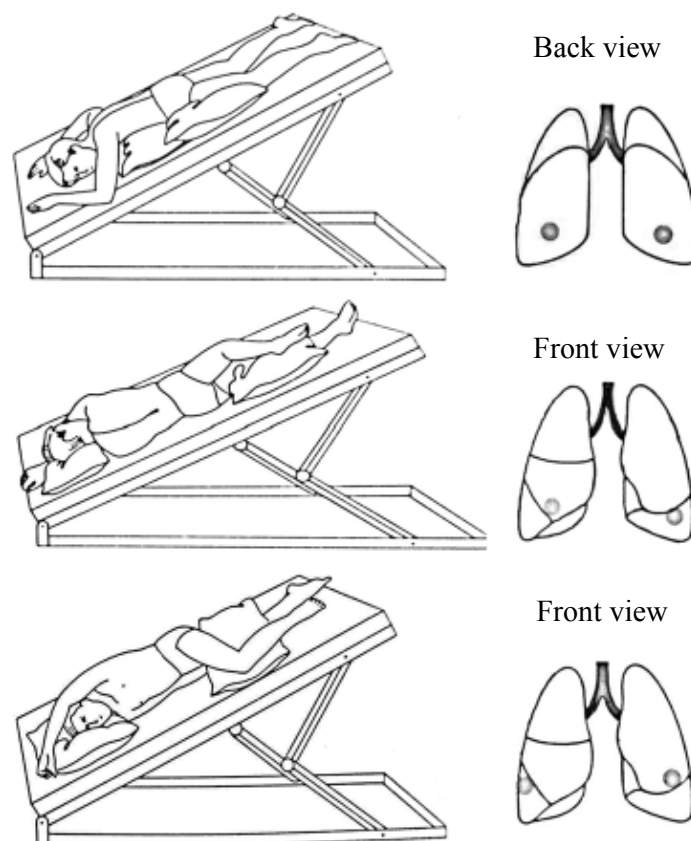
The nurse makes sure that the patient performs this procedure 5–6 times during the day.

4. This method is applicable if there is a functional bed on which the patient lies. The foot end of the bed is raised 20–30 cm above the level of the head end (Quincke position).

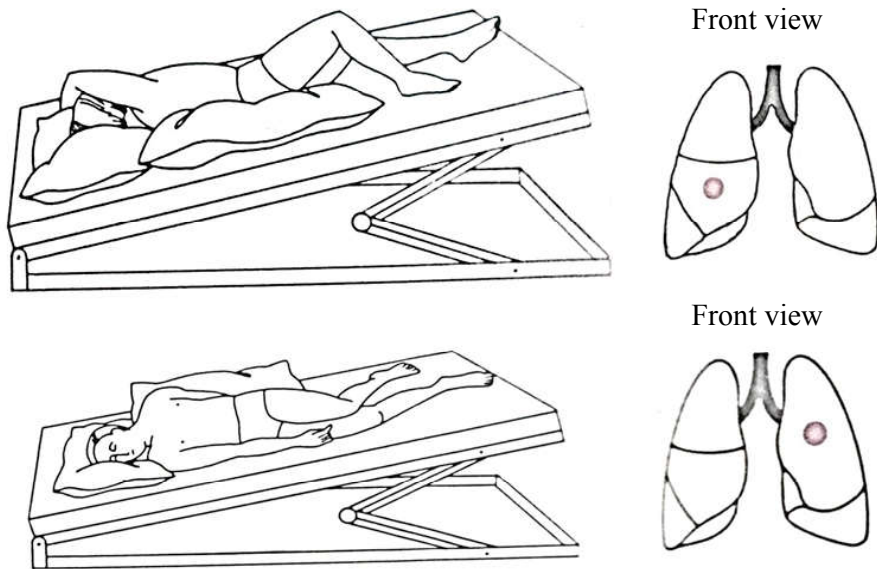
This procedure is carried out several times for 20-30 minutes with a break of 10–15 minutes. They monitor the parameters of hemodynamics and the patient's well-being.

At the end of the postural drainage procedure, the patient is helped to take a comfortable position; after that, disinfection and spittoons and sputum disinfection are carried out. A record is made in the medical history of the procedure and the patient's reaction to it. It is important to note: if none of the drainage positions causes relief of sputum discharge, then the use of the technique should be considered ineffective. In some cases, the use of other options should be considered (Nursing procedures 2-nd ed. Pennsylvania: Springhouse Corporation, 1996.), which are schematically depicted in the figures below.

The options are shown in the figures: the position of the patient's body with a different location of the inflammatory focus in the lungs, for example, an abscess (the inscription «front view» or «rear view» indicates the localization of infiltration). Moreover, for the first three inclined positions, the angle of inclination of the functional bed is 30 (Fig. 2). Two more inclined positions using a functional bed — at an angle of 15 (Fig. 3).

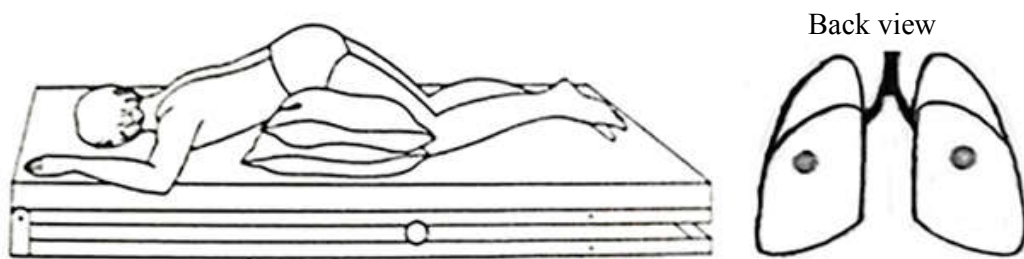


*Fig. 2.* Drainage positions with functional bed tilt angle 30°

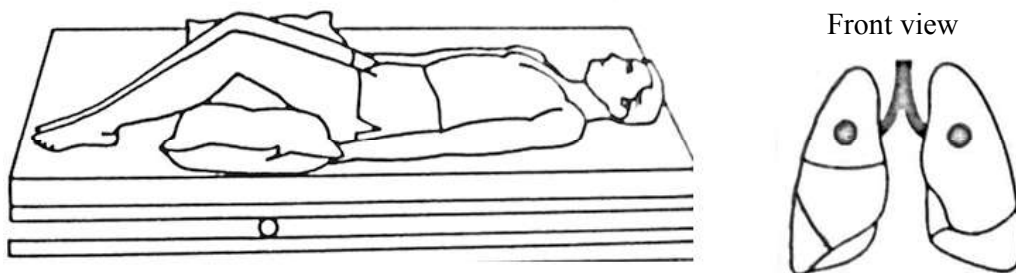


*Fig. 3.* Drainage positions with functional bed tilt angle 15°

Some more drainage positions: lying on the abdomen, in which the slope is created using pillows (Fig. 4); drainage position on the back (Fig. 5).

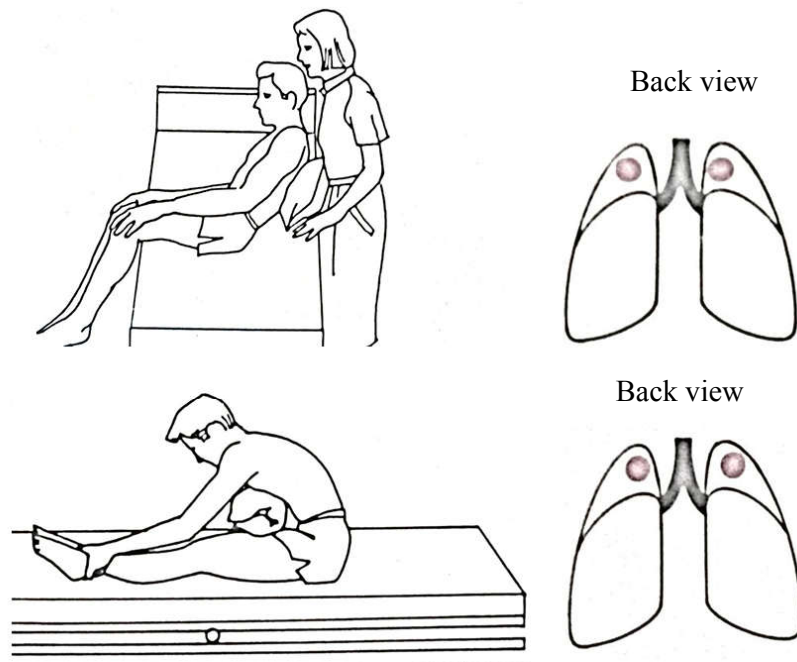


*Fig. 4.* Drainage position on the abdomen



*Fig. 5.* Drainage position on the back

Seated drainage positions are also used — with support under the back and the tilt forward (Fig. 6).



*Fig. 6. Drainage in sitting position*

In each of the positions, it is proposed to perform a light vibration massage, which can be performed by a trained masseur.

Medical care for patients with chest pain, shortness of breath, suffocation, asphyxia, hemoptysis and pulmonary bleeding

## **HELP THE PATIENT WITH CHEST PAIN**

Caring for a patient with pleural pain consists in giving the patient an optimal position on the affected side – in this position, respiratory movements are limited. To reduce the pain in the chest, the patient himself takes a forced position (on the sick side), tries to breathe superficially and tries to delay coughing tremors.

In addition, the simplest physiotherapy procedures are performed according to the doctor's prescription, the patient is provided with medications prescribed by the doctor — painkillers and cough-reducing agents. Pleural pain is also reduced by setting mustard plasters as a distracting therapy; it is possible to lubricate the chest with iodine tincture.

It should be remembered, however, that if the patient's temperature rises above 38 C, any physiotherapy procedures are contraindicated.

If a patient has exudative pleurisy — inflammation of the pleura with fluid effusion into the pleural cavity — a pleural puncture is performed on the doctor's prescription, in this case it is necessary to prepare the patient for the procedure and assist the doctor during it.



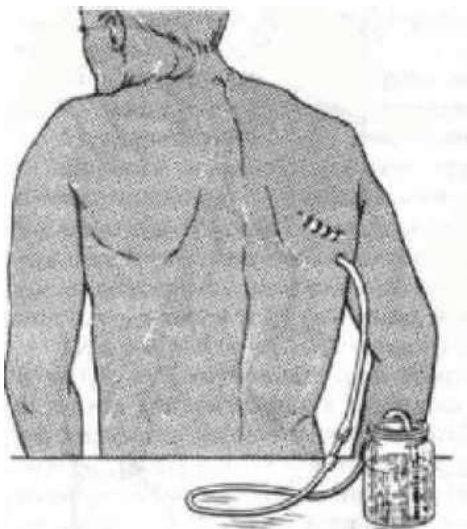
With aseptic myositis resulting from an episode of hypothermia, it is advisable to use a warming compress as an analgesic.

**The method of setting a warming compress.** Local warming compresses are used as a distracting and anti-inflammatory agent for local inflammatory processes. Before applying a warming compress, the skin should be cleaned, for example, wiped with alcohol. The warming compress consists of three layers. Gauze or any other clean, soft and hygroscopic fabric folded in several layers is moistened with warm water or alcohol diluted with water (40–50 % solution) and applied to the skin. A waterproof layer of oilcloth or waxed paper is placed on top of the application, which is covered with a heat-insulating layer of cotton wool. It is necessary that each layer is 2–3 cm wider than the previous one. The compress should be carefully bandaged. After 12 hours, the compress should be replaced; before setting a new compress, you should take a break for 2 hours. Alcohol compresses evaporate and dry out faster, so they are replaced more often.

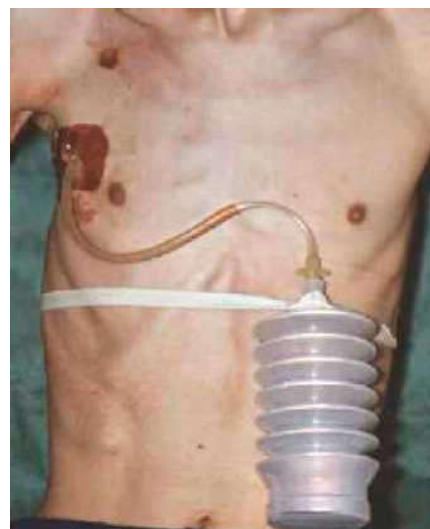
It should be remembered that skin diseases are a contraindication to applying a compress.

## DRAINAGE OF THE PLEURAL CAVITY

If it is necessary to continuously remove air and fluid from the pleural cavity, a plastic drainage tube is inserted into it (Fig. 7, 8) (manipulation in aseptic conditions is performed by a surgeon). The skin around the drainage tube is treated with a solution of antiseptics (1 % iodonate, 0.5 % chlorhexidine, etc.), the wound is closed with a sterile bandage. In order for the drainage not to fall out, it is fixed to the skin with stitches and a Band-Aid.



*Fig. 7.* Pleural cavity drainage by Beaulau



*Fig. 8.* Drainage of the pleural cavity in spontaneous pneumothorax by a device for active drainage of wounds of single use

It should be known that drainage as a method is the main one among the methods of physical antiseptics. The name of the method comes from the English «drain» — to drain, drain — and implies ensuring the outflow of the contents of wounds, abscesses, various cavities and hollow organs. Drainage can be performed with rubber, PVC and other tubes of various diameters (drains), which are injected into the pleural or abdominal cavity. Rubber or gauze strips as drainage are injected into the wound, the cavity of the abscess, the joint. Drains must have chemical and biological inertia and ensure adequate outflow of contents. Pus, tissue decay products, and with them microorganisms are isolated through one or more drains and evacuated to special containers, evacuation to a bandage is possible.

The drainage of the pleural or abdominal cavity is usually connected by a tube to a vessel containing an antiseptic solution. The presence of drainage in the wound or in the purulent cavity allows, if necessary, to administer antibiotics, solutions of antiseptic drugs, proteolytic enzymes. An important principle of adequate drainage is the observance of tightness.

Indications for drainage of the pleural cavity are pneumothorax (accumulation of air in the pleural cavity), hemothorax (accumulation of blood in the pleural cavity), hemopneumothorax (accumulation of blood and air in the pleural cavity), purulent lung diseases (abscesses) with a breakthrough into the pleural cavity; surgical interventions on the lungs, pleura, mediastinum. The skin in the drainage installation area is lubricated with an antiseptic solution (for example, 0.5% chlorhexidine). The wound is closed with a sterile bandage; drainage is fixed to the skin with sutures and adhesive plaster.

The most widespread drainage of the pleural cavity according to Bulau (Fig. 7) (passive drainage). The mechanism of action of such pleural drainage is as follows. When inhaled, the lung straightens and removes the contents of the pleural cavity under pressure into the drainage tube and then into the vessel through a light artificial rubber valve worn on the distal end of the tube and tightly tied on it. When exhaling, a physiological decline of the lung occurs, as a result of which a negative pressure is created in the tube; the latter, in turn, leads to the closure of the valve, for this reason, the contents of the collecting vessel do not enter the pleural cavity.

It is also possible to connect the drainage to the suction system (with negative pressure); this is the so-called active drainage.

After the pleural drainage is installed, the nurse takes care of it is the responsibility of the nurse, who performs the following:

1. Constantly monitors the patient and makes sure of the adequate functioning of the drainage system, in maintaining its tightness and patency. Violation of tightness can lead to the entry of air into the pleural cavity, followed by displacement of the mediastinum. The deterioration of the condition of patients in this case is expressed as follows: tachycardia and hypotension develop, breathing becomes more frequent, cyanosis manifests itself; cardiac arrest is not excluded.

Blockage of drainage manifests itself by the absence of fluid movement through the connecting tubes.

2. Regularly replaces the peripheral part of the drainage system, and ensures its sterilization.

3. Changes the container with the detachable as it is filled.

4. Regularly (every day) washes the central part of the system with antiseptics, for example, with a solution of furatsilin 1 : 5000.

5. Notes in the medical history the volume and nature of the discharge.

6. Introduces medications through a drainage tube into the pleural cavity when prescribed by the attending physician.

7. Immediately notifies the doctor if the discharge through the tube becomes unusually intense or bloody, in case of drainage loss, as well as in case of drainage blockage (a sign is complete cessation of discharge through drainage).

Independently dropped pleural drainage is not inserted by the nurse. The clogged drainage tube is washed by the surgeon. The nurse can independently eliminate the inflection of the tube that caused the blockage.

Signs of proper drainage functioning:

- reducing the volume of liquid antiseptic in a vessel on a tripod;
- increase in the volume of biological fluid in the collected container;
- fluid movement through the connecting tubes;
- positive dynamics in the patient's well-being and in the course of the disease.

## **HELP THE PATIENT WITH SHORTNESS OF BREATH**

To create an elevated position for the patient in bed half-sitting, using a pillow, a headrest or a raised upper part of a functional bed as a support for the back.

To facilitate the work of the respiratory muscles, the patient's torso should be freed from the restraining clothes, from the heavy blanket. To ensure the supply of maximum fresh air to the room; moreover, it should be taken into account where the windows of the room or ward go: if the windows overlook the city highway, it is better to use air conditioning if available. If there is a centralized oxygen supply in the ward, it is necessary to provide the patient with the opportunity to breathe moistened oxygen.

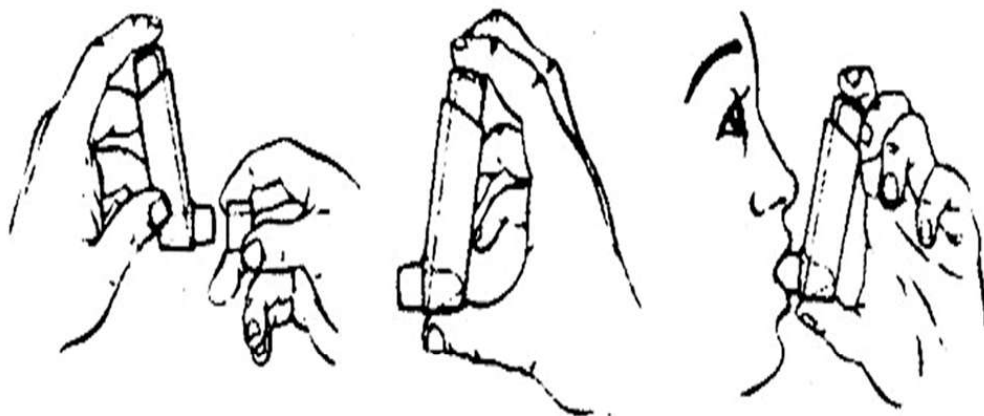
Pre-medical care for a patient with a choking attack (on the example of bronchial asthma). With an attack of bronchial asthma, you should calm the patient, first of all, create a calm psychological environment by your actions. Be sure to provide access to fresh air, while excluding the entry of an allergen (for example, outdoor air containing pollen); it is advisable to supply oxygen if possible. It is necessary to free the neck area from restrictive clothing; the patient should be protected from

excessive cooling. At the time of the attack, it is better to seat the patient, it is desirable to provide support for the hands (in the edge of the bed) and the patient's back (fatigue, dizziness is possible). To stop an attack of mild severity in a patient with bronchial asthma, a single inhalation of a short-acting beta-adrenomimetic, for example, salbutamol or berotec, is effective. Often, a metered-dose inhaler with one of these drugs is available to the patient; or it should be in a package for emergency care in a medical institution, including an outpatient one. To improve the formation of sputum and facilitate coughing, the patient is offered a warm drink. Monitoring of the condition also involves calculating heart rate, measuring blood pressure. The nurse stays with the patient until the asthma attack is stopped.

### **RULES FOR THE USE OF AN INDIVIDUAL INHALER**

Inhaled forms of anti-inflammatory and bronchodilators are optimal for regular daily delivery of medicinal aerosols deep into the respiratory tract of the patient. Pocket inhalers — a special dosage form in a specific package is used to treat various diseases of the respiratory tract, primarily bronchial asthma and chronic obstructive pulmonary disease. Inhalers are produced in the form of aerosol (contain the drug in the form of a micronized suspension) and powder. This route of drug administration has proved to be the most effective for the treatment of this group of diseases.

However, improper use of a pocket inhaler dramatically reduces the effectiveness of treatment, since access to the medicinal substance is not provided sufficiently. The patient should be taught the rules of using an aerosol inhaler (Fig. 9); the nurse should also check the assimilation of the skill.



*Fig. 9. Rules for using an individual inhaler*

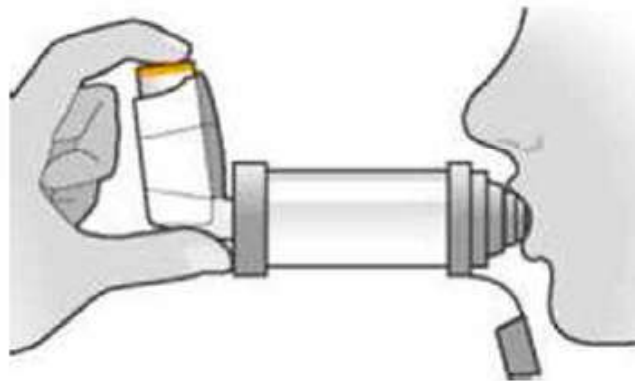
The sequence of actions for an aerosol inhaler:

- turn the can upside down and remove the protective cap from it;
- shake the inhaler thoroughly;
- make the deepest possible free exhalation;
- tightly wrap your lips around the mouthpiece of the can, slightly tilting your head back;
- simultaneously perform 2 actions: press firmly on the bottom of the can (to release the aerosol dose) and inhale as deeply as possible;
- hold your breath for 5–10 seconds;
- remove the mouthpiece of the can from the mouth, then slowly exhale;
- close the can with a protective cap.

Using an aerosol inhaler, you can use an additional device — a spacer (Fig. 10), which is a plastic volumetric chamber connecting the metered inhaler and the patient's respiratory tract; the speed of the aerosol jet slows down in the spacer (Fig. 11).



*Fig. 10. Spacer*

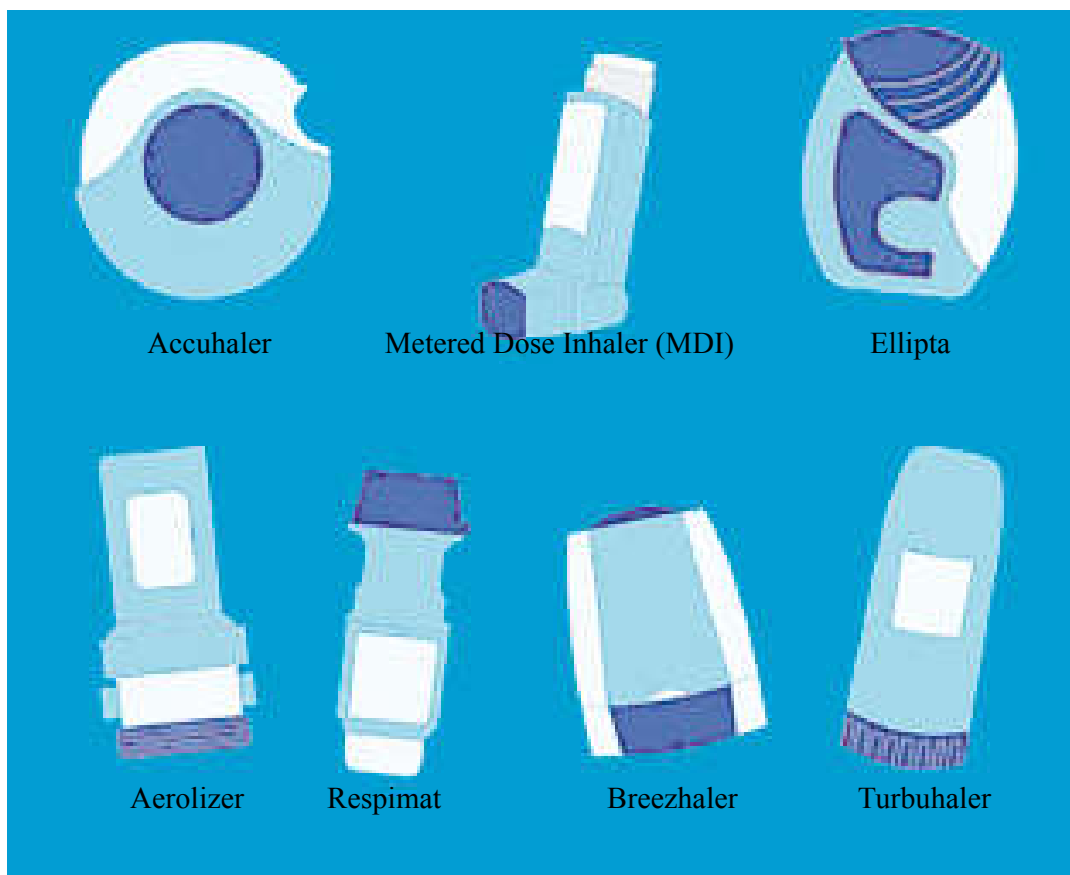


*Fig. 11. The scheme of using the spacer*

The spacer is designed to delay large-dispersed drops of medicinal aerosol that cannot reach the distal branches of the bronchial tree, which limits the bronchodilating effect on the wall of spasmodic bronchioles; as a result, particles of the smallest size penetrate into the respiratory tract of the patient.

The use of a «spinhaler» type device (Fig. 12) also requires training of the patient to comply with a number of rules of use. This device is designed to inhale a powdered medicinal substance enclosed in a gelatin capsule.

Modern powdered inhalers can have a series of doses in the form of a tape or disk — for example, the drug Seretid-multidisk (Accuhaler); the technique of using this drug is significantly simplified for the patient compared to a device of the «spinhaler» type.



*Fig. 12.* The main types of individual inhalers

Among the equipment for the inhalation administration of medicines with exacerbation of bronchial asthma, the already mentioned ultrasonic nebulizer is now often used — a device that allows you to convert a liquid drug into an aerosol suitable for inhalation. The set operating mode of the nebulizer creates conditions for the formation of fine particles that are reliably delivered to the distal bronchi with a jet of inhaled air. A nebulizer is a portable device that has a portable, but not a pocket format. It is used for sufficiently long inhalations of liquid medicinal substances and is used primarily during periods of exacerbations of various bronchial obstructive diseases. The device can be used in a hospital setting, as well as at home in accordance with the instructions; in the latter case, the patient's training may also be part of the duties of a nurse.

Asphyxia is a life-threatening condition in which, as a result of various causes (mechanical, functional, pathological), oxygen starvation (hypoxia) develops with the accumulation of carbon dioxide in the blood (hypercapnia). There are various types of asphyxia and many reasons that lead to the development of this condition:

- compression of the throat and trachea from the outside;
- chest compression;
- neck injury, displacement of the larynx, tongue sinking;

- ingestion of a foreign body or fluid into the respiratory system (solid objects, water, vomit, blood);
- compression of the trachea by a tumor;
- tissue edema caused by laryngitis, tracheobronchitis, acute pneumonia, bronchial asthma;
- angioedema;
- pulmonary edema, pneumothorax or haemothorax;
- tracheal burn is thermal or chemical;
- massive bleeding.

Non-mechanical factors include:

- stroke;
- heart failure;
- traumatic brain injury;
- intoxication;
- overdose of narcotic drugs or medicines.

Asphyxia can develop as a result of paralysis of the **respiratory** muscles due to:

- infectious diseases (tetanus, botulism, myasthenia gravis, diphtheria, polio);
- overdoses of toxic substances (curare-like chemical compounds);
- spinal cord injuries.

Before providing first aid for asphyxia, it is very important to determine its cause, otherwise it will not be possible to help a person. The patient should be calmed down in all possible ways so that he does not interfere with subsequent actions aimed at providing first aid. In the presence of mechanical asphyxia, an object that has entered the respiratory organs must be removed outside. This is done by the Heimlich method, when the rescuer is located behind the patient, clasps his hands in a lock on the chest of the suffocating person and squeezes his diaphragm with sharp squeezing movements. Such shocks help to remove accumulated air from the lungs, which, with its mass, helps, in turn, to push out the stuck object.

In case of allergies or an attack of bronchial asthma, the victim is released from tight clothes, taken out into the fresh air. In case of allergies, it is appropriate to give a person an antihistamine, a warm liquid for drinking, which will contribute to the elimination of the allergen from the body.

## **PRE-MEDICAL EMERGENCY CARE FOR A PATIENT WITH HEMOPTYSIS AND PULMONARY HEMORRHAGE**

A patient with hemoptysis and pulmonary hemorrhage needs urgent treatment and care. The care of a patient with hemoptysis involves the following measures. A patient with any bleeding should be calmed down, since he is usually excited;

he should be given complete mental and physical peace, forbidden to talk before the doctor arrives and smoke. The medical staff on duty must provide immediate notification to the doctor and constantly stay at the patient's bedside until the bleeding stops completely; a nurse should maintain a patient's calm emotional state. Bed rest is prescribed, but in bed it is necessary to give the patient a comfortable elevated sitting or half-sitting position with a tilt to the affected side in order to avoid blood flowing into a healthy lung. The patient is covered with pillows from all sides as a support. If you know which lung is bleeding from, put an ice bubble on this side of the chest — a wide-mouthed container filled with  $\frac{3}{4}$  crushed ice and closed with a screw cap; the «bubble» is wrapped in a towel or a folded diaper before application. They hold the ice bubble for periods of 30 minutes, taking 15-minute breaks. If necessary, the melted ice in the container is replaced. Ice is also allowed to be swallowed, which leads to reflex vasospasm and a decrease in blood filling of the lungs. Both with hemoptysis and with pulmonary bleeding, cans, mustard plasters, chest warmers are strictly contraindicated.

When hemoptysis occurs during coughing, it is necessary to stop coughing by all available means, since it increases hemoptysis and worsens the patient's condition. With a strong cough that increases bleeding, the patient is given antitussive drugs prescribed by a doctor. If the patient is not able to rinse his mouth on his own, the nurse takes care of the oral cavity: takes a sterile napkin, wraps it on a spatula or a korntsang and gently wipes the oral cavity, removing the remnants of bloody sputum. The used napkins are collected in a special container with a desalination solution and subsequently disinfected.

When caring for a patient with bleeding, observe the safety rules adopted when working with blood, which is always considered as potentially infected with human immunodeficiency virus, hepatitis B or hepatitis C viruses. A necessary measure of medical care is to monitor the state of the cardiovascular system of a patient with bleeding: pulse, blood pressure, level of consciousness; a sterile syringe with needles should be ready to administer the necessary medications for emergency maintenance of systemic hemodynamics, if necessary.

With hemoptysis and after stopping pulmonary bleeding, cold dishes are served, semi-liquid, in the form of jelly, mousse or sambuc, which are easily digested. Only cold drinks are offered. Exposure to high temperatures, including when ingested with food or drink, can activate bleeding. With hemoptysis and with the threat of pulmonary bleeding, a hot bath or shower, setting cans, mustard plasters, hot water bottles and hot compresses on the chest are strictly contraindicated for the patient. However, hypothermia of the patient should not be allowed; the patient should be dressed in pajamas and covered with a blanket.

The technique of using an individual peak flowmeter — a device that allows you to measure the peak volume rate of exhalation in a patient with bronchial asthma — should also be the subject of a nurse's attention. The readings of the



peak flowmeter allow us to evaluate the effectiveness of bronchial asthma control. The peak exhalation rate (PSV) is the maximum volume of air that the patient is able to exhale per unit of time after the maximum possible inhalation and is measured in l/min. There is a significant variability of PSV (the difference between morning and evening PSV > 20 %) during the day and depending on the level of bronchial obstruction. Therefore, measurements are made several times a day according to the doctor's instructions.

Modern portable peak flowmeters (Fig. 13) are made of plastic; they are necessary for daily assessment of the severity of bronchial obstruction in a patient. The device should be used regularly at home. It is preferable to compare the results of peak flowmetry in a particular patient with his own best indicators. The patient's personal peak flowmeter is used — for hygienic reasons and also because the use of different peak flowmeters can lead to different PSV values, and the range of proper PSV values is very large. The best indicator is usually recorded during the absence of symptoms. This indicator is used as a reference when evaluating the results of therapy.

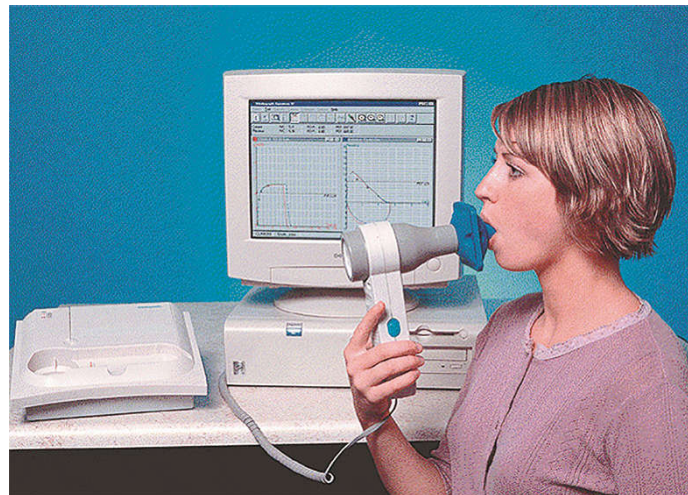


*Fig. 13.* Variants of modern individual peak flowmeters

The patient is carefully instructed. The measurement of the peak volume exhalation rate using a peak flowmeter should be carried out in the morning immediately after waking up and before taking medications. The patient is trained to make the deepest forced exhalation after the deepest possible inhalation. When exhaling, the mouthpiece of the device should be tightly wrapped around the lips to ensure tightness of the connection. In the evening, PSV is measured before going to bed, getting, as a rule, a higher indicator. The received data are entered into a specially opened diary and further analyzed. The accuracy of measurements and the correct interpretation of the data obtained are important for assessing the severity of the BA course.

As part of the care of a patient with a pulmonological profile, the nursing staff also provides adequate disinfection of diagnostic equipment – disinfection of mouthpieces after spirometry or pneumotachometry, sterilization of biopsy forceps and brushes for bronchoscopy with biopsy, sterilization of a rubber catheter for bronchial contrast during bronchoscopy.

Spirometry is a method of studying the function of external respiration, which allows you to determine the main parameters of respiration: respiratory volume (UP to), reserve volumes of inhalation and exhalation, vital capacity of the lungs, forced vital capacity of the lungs, maximum ventilation of the lungs and other indicators. Based on the data obtained, the presence or absence of signs of respiratory insufficiency in the patient is ultimately judged, its varieties (obstructive or restrictive) are identified. Use a special device — a spirometer. (Fig. 14)



*Fig. 14. Spirometer*

A special mouthpiece is placed in the mouth of a patient who is sitting on a chair in front of the device; a terminal is placed on the nose; thus, the closed system created allows all exhaled air to be directed into the device. A spirometry curve is recorded on a moving strip of paper with the help of a scribe, which is subsequently

analyzed and calculated — usually using a computer program; the results obtained are compared with the proper values.

The spirograph should be prepared for operation: after use, the rubber mouthpieces should be soaked in 0.5 % chloramine solution for 2 hours, then sterilized by boiling for 45 minutes.

Pneumotachometry is the study of the mechanics of breathing when measuring the velocity of the flow of inhaled and exhaled air.

A pneumotachometer is a device for measuring the velocity of the air flow of inhalation and exhalation; part of it is a special metal tube on which removable sterilized plastic tips are put on; the patient repeats the most energetic inhalations and exhalations. Through a metal tube, air is discharged into the recording unit of the device, where the indicators are determined. The speeds and volumes of inhaled and exhaled air are graphically recorded. The recording is performed using a pneumotachograph and is called a pneumotachogram. Pneumotachometry is a simple method that, like spirometry, allows you to tentatively identify signs of obstructive and restrictive respiratory insufficiency in the patient according to the speed characteristics of inhalation and exhalation.

Preparation of the pneumotachometer is as follows: removable plastic tips (mouthpieces) are soaked in 0.5% chloramine solution for 2 hours, rinsed with distilled water and wiped with alcohol

Bronchoscopy is a method that allows using a flexible fibrobronchoscope to carefully examine the mucous membrane of the trachea and branching bronchi; if necessary, it is possible to take bronchial flushing waters or conduct a biopsy for examination. Special brushes and biopsy forceps for sampling the material are inserted into the bronchoscope through a special biopsy channel. Within the framework of special care, the protocol for processing the appropriate tools is being studied.

The processing of a part of the equipment is also required for bronchography, an X-ray method of examining the bronchi with the introduction of a contrast agent into the bronchial tree, which makes it possible to identify structural disorders — bronchiectasis or narrowing. At the same time, a contrast agent (yodlipol) is injected into the central bronchus (right or left, depending on the need) through a sterile rubber catheter. The used catheter is then subjected to disinfection, pre-sterilization cleaning and further sterilization according to a special protocol for rubber products.

Oxygen therapy is a method of using oxygen for therapeutic purposes; usually for substitution therapy. Only medical oxygen is allowed for oxygen therapy. According to existing state standards, medical oxygen cylinders contain 99 % oxygen, 1 % nitrogen; the gas has no other impurities (methane, carbon dioxide, hydrogen sulfide). Medical oxygen is a colorless, odorless gas. The cylinders contain oxygen gas at a pressure of 150 atm. Oxygen is used at a pressure

of no more than 2–3 atm., therefore, a special device — a reducer — is attached to the cylinder to lower the pressure; a pressure gauge designed for the pressure in this system is installed on it. At the outlet of the system, a mixture containing 40 to 80 % oxygen is used for oxygen therapy. Cylinders with medical oxygen are painted blue and have the inscription «oxygen» in black paint, as well as the letter «M»; their capacity is 40 liters.

The main indications for the appointment of oxygen therapy are high oxygen debt in the body of a patient with hypoxemia, in patients with chronic and acute respiratory, as well as with heart failure. Methods of oxygen supply to the patient. For therapeutic purposes, an inhalation method of oxygen injection is usually used. To avoid burns, oxygen is passed through water and moistened.



*Fig. 15.* Nasal cannulas — can be expected to provide  $FiO_2$  up to 30–35 %



*Fig. 16.* Face mask — can be expected to provide  $FiO_2$  up to 40–45 %

Methods for supplying oxygen to a patient:

1. Introduction of oxygen through nasal catheters – with centralized oxygen supply, it is supplied from a compressed oxygen cylinder stored in a special room through a system of metal tubes conducted into the wards. The catheter (Fig. 15) is inserted into the lower nasal passage to a depth of about 15 cm (for an adult). Before administration, a sterile disposable catheter is lubricated with sterile vaseline.

2. Introduction of oxygen through the mask (Fig. 16). The mask applied to the face should cover the mouth and nose; it has an inhalation and exhalation channels, and the tube of the inhalation channel is connected to a thin rubber bag in which oxygen accumulates during exhalation; which, when inhaled, actively enters the lungs.

3. Introduction of oxygen through a ventilator. In this case, intubation is performed and an intubation tube is used.

4. Oxygen tents, which are usually provided with devices for absorbing carbon dioxide and cooling the air. The tent receives a moistened oxygen-air mixture, with an oxygen content of 40–50 %.

5. Hyperbaric oxygenation (from the Greek «barus» — heavy), is a therapeutic method of saturating the body with oxygen, which is supplied under high pressure. Hyperbaric oxygenation sessions for one or more patients are carried out in special hermetically sealed rooms – pressure chambers.

In addition to the use of oxygen in medical institutions, in some countries it is allowed to use it for therapeutic purposes at home.

## TEMPERATURE MEASUREMENT METHODS

**Thermometry** is a set of methods and methods for measuring temperature, including measuring human body temperature.

The human body temperature is an indicator of the thermal state of the body and remains relatively constant. Physiological temperature fluctuations during the day are known.

In elderly and senile people, the temperature is slightly lower than in young and middle-aged people. At an early age, there is a special instability of body temperature with large fluctuations during the day.

The human body temperature depends on:

- the place of measurement;
- time of day;
- age;
- eating;
- strong emotional stress;
- in women during pregnancy and menstrual cycle.

To measure body temperature (thermometry), special devices are used — thermometers, or as they are also called — thermometers.

A thermometer is a device used to measure temperature. The mercury thermometer, in the form in which we recognize it, was invented by Gabriel Fahrenheit, back in 1723. Together with the thermometer, he suggested using his own scale for temperature indicators, which is still used today — the Fahrenheit scale (°F). However, in Russia, a different unit of temperature measurement is used — Celsius (°C).

All methods of temperature measurement are divided into:

- contact based on heat transfer to a device measuring temperature by direct contact;
- non-contact, when heat transfer to the device is carried out by radiation through an intermediate medium, usually through air.

**Mercury thermometers.** A mercury thermometer (thermometer) has a thin glass body, one end of which is occupied by a mercury tank. A capillary, sealed at the other end, departs from it. Mercury, heating up and increasing in volume, rises along the capillary along which the thermometer scale is located. The scale is designed to determine body temperature with an accuracy of 0.1 °C. Body temperature can be measured from 34 to 42 ° C. The thermometer shows the maximum height of the mercury column and is therefore called the maximum. It cannot descend into the tank on its own, since this is prevented by a sharp narrowing of the capillary in its lower part

**Electronic (digital) thermometers.** In electronic (digital) thermometers (Fig. 17), body temperature is measured due to the built-in sensor. The measurement result is displayed on a digital scoreboard. Electronic thermometers have built-in functions such as: a beep at the end of the measurement; memory for the last few measurements; replaceable caps for hygiene purposes; moisture-proof housing.

**Infrared thermometers.** This is a relatively new type of thermometer. The temperature measurement takes only 2–5 seconds. Infrared thermometers are (Fig. 18) of several types: ear, frontal and non-contact. The measurement of body temperature by such a thermometer occurs due to the fact that the sensitive element reads the infrared radiation data of the human body. In order to verify the accuracy of the result, you can measure the temperature 2–3 times. The measurement result is displayed on the w/c display.



Fig. 17. Electronic (digital) thermometer



Fig. 18. Infrared thermometers



Fig. 19. Thermometer in the form of a nipple

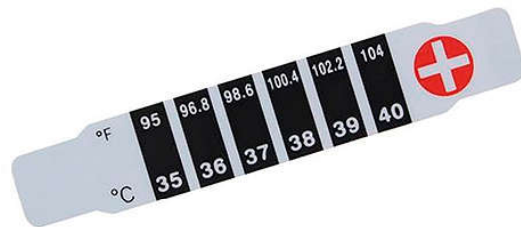


Fig. 20. Thermal strips

On the thermometer in the form of a nipple there is a digital display, which also glows green at normal temperatures. If the temperature rises above 37 °C, the display will turn red. Temperature measurement time — 3–5 minutes (Fig. 19).

Thermal strips. Thermal strips (Fig. 20) are a kind of sensitive film. It works due to the crystals in it, which react to body temperature and change color. The thermal strip has a clear scale of 36 °C, 37 °C, 38 °C and so on. Therefore, they do not give an exact temperature, you can only find out within what limits the temperature is. The following factors also play an important role in determining the temperature of the thermal strip: the presence of sweat, the density of the fit to the body, illumination.

## **METHODS OF MEASURING BODY TEMPERATURE**

To measure body temperature as accurately as possible, it is necessary to measure it with a thermometer. There are three main ways to measure body temperature in patient care:

- axillary measurement (in the armpit);
- oral measurement (in the oral cavity);
- rectal measurement (in the rectum).

Algorithm for measuring body temperature in the armpit

I. Preparation for the procedure:

1. Prepare a dry clean thermometer: check its integrity, if necessary, wipe dry with a clean cloth.
2. Introduce yourself to the patient, explain the course of the upcoming procedure
3. Treat the hands in a hygienic way, drain.
4. Shake the mercury thermometer from top to bottom so that the mercury drops down the column into the tank.
5. Help the patient to take a comfortable position.

II. Performing the procedure:

1. Examine the armpit, if necessary — wipe dry with a napkin or ask the patient to do it.
2. Position the thermometer in the armpit area so that the mercury reservoir is in close contact with the patient's body from all sides (press the shoulder against the chest).
3. Leave the thermometer on for at least 5 minutes.
4. Remove the thermometer from the armpit, read the thermometer readings, holding it at eye level.
5. Inform the patient of the measurement results.

6. Shake the thermometer from top to bottom, so that the mercury drops down the column into the tank, place it in a disinfection container.
7. Treat your hands in a hygienic way, dry them.
8. Make an appropriate record of the results of the performance in the medical documentation.

Algorithm for measuring temperature in the rectum:

I. Preparation for the procedure:

1. Prepare a dry clean thermometer: check its integrity, if necessary, wipe it dry with a clean cloth.
2. Introduce yourself to the patient, explain the course of the upcoming procedure.
3. Treat your hands in a hygienic way, dry them, put on gloves.
4. Shake the mercury thermometer from top to bottom so that the mercury drops down the column into the tank.
5. Lubricate the thermometer reservoir with vaseline
6. Ask the patient to lie on his side, bend his legs at the knee and hip joints.

II. Performing the procedure:

1. Push apart the buttocks of the patient with 1 and 2 fingers of the left hand, examine the area of the anal opening.
2. Insert the thermometer reservoir into the anal opening to a depth of 3-4 cm. If there is resistance to the introduction of a thermometer, the procedure should be stopped immediately.
3. Leave the thermometer on for at least 5 minutes.
4. Remove the thermometer, wipe it with a napkin, count the result
5. Wipe the anus with a napkin, help the patient to take a comfortable position.
6. Inform the patient of the measurement result
7. Place the thermometer in a disinfection container. Disinfect the used material. If the napkin is not contaminated with biological fluids, then it can simply be disposed of.
8. Remove gloves, put them in a disinfection container.
9. Treat your hands in a hygienic way, dry them.
10. Make an appropriate record of the results of the execution in the medical documentation. Thermometry in the rectum is contraindicated in case of stool retention, diarrhea, diseases of the rectum

Body temperature measurement is carried out, as a rule, 2 times a day: in the morning from 6 to 9 o'clock and in the evening from 17 to 19 o'clock; according to the doctor's prescription, temperature measurement can be performed more often, as needed.

Before measuring the temperature, the patient needs to rest (10–15 minutes); take measurements no earlier than an hour after eating; in emergency situations, this is not taken into account.



When measuring the temperature of a patient with mental disorders, the presence of junior medical personnel is necessary to avoid attempts to swallow the thermometer or open the veins.

When using an electronic thermometer, it is necessary to follow the instructions for using this device.

Disposable chemical thermometers are used to measure the temperature in the mouth or in the armpit area. When used orally, the thermometer is placed in the oral cavity arbitrarily with the matrix up, the result is read after 60 seconds; the measurement results in the armpits are evaluated after 3 minutes, a strip with a dot matrix must be attached to the body.

The patient's informed consent form when performing the procedure and additional information for the patient and his family members

The patient should be informed about the upcoming temperature study.

Written confirmation of the consent of the patient or his relatives (trusted persons) for temperature measurement is not required, since this diagnostic method is not potentially dangerous to the life and health of the patient.

Registration of thermometry data

In the medical facility, the names of all patients (by ward), the date and time of temperature measurement (morning, evening) are indicated in the post temperature sheet.

The temperature measurement results are transferred from the post temperature sheet to the Individual temperature sheet (Fig. 21).

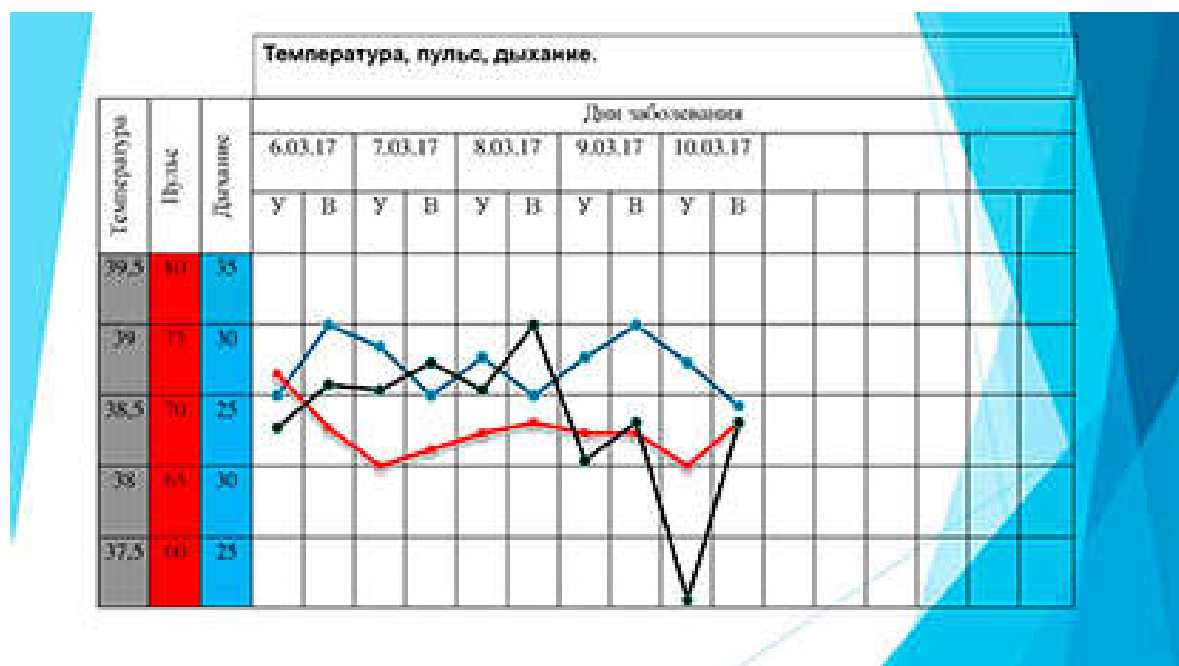


Fig. 21. Individual temperature sheet

It is started in the emergency department along with a medical card for each patient admitted to the hospital.

In addition to graphical recording of temperature measurement data (T scale), it plots pulse rate curves (P scale) and blood pressure (BP scale).

In the lower part of the temperature sheet, data on the calculation of the respiratory rate in 1 minute, body weight, as well as the amount of fluid consumed per day and urine excreted (in ml.0, Data on defecation (stool) and sanitation are indicated with a «+» sign.

The days of illness are marked along the abscissa axis of the temperature sheet. Every day of the disease is designed for a double measurement of body temperature. Along the ordinate axis there is a temperature grid, each division of which is 0.20 °C.

The corresponding points are applied to the results of daily two-time thermometry. The morning temperature is recorded by a dot in the column «Y», the evening temperature in the column «b». These points are connected to each other, forming so-called temperature curves that reflect one or another type of fever in the presence of fever.

## **FEATURES OF MEDICAL CARE FOR PATIENTS WITH RESPIRATORY DISEASES**

Tracheostomy is a surgical operation in which a hole is formed in the trachea to facilitate breathing. A cannula or tracheostomy tube is installed for the operation of the device, or the skin is sewn to the trachea with the formation of a stoma (fistula). Tracheostomy is performed by a surgeon. Situations requiring staging are associated with the severity of the patient's condition and the inability to breathe independently. The causes are narrowing of the trachea and larynx with a tumor, head and neck injuries, severe traumatic brain injury requiring artificial ventilation, stroke with bulbar lesions of the brain, blockage of the upper respiratory tract with mucus, pus or swelling of the epiglottis and vocal cords. The surgeon also performs the following manipulations with the tracheostomy tube: prevention and treatment of wound infection, hydration, sanitation of the trachea and oropharynx, replacement of the tracheostomy tube, decanulation. Tracheostomy allows you to: facilitate the rehabilitation of the tracheobronchial nerve, reduce the risk of infectious complications (for example, inflammation of the lungs), better assess the condition of the oropharynx and larynx. Tracheostomy can be temporary or permanent.

High-quality postoperative nursing care reduces the risk of complications during tracheostomy. With a temporary tracheostomy, a plastic tube with a wide inner diameter is used, to which it is possible to attach respiratory equipment. With

a permanent tracheostomy, a metal tube is used, which consists of an external capsule, a conductor (used for staging) and an internal sink. When breathing through the tracheostomy, the air entering the trachea does not warm up, does not moisten, as it happens when breathing through the nose. There is always a greater risk of infection through the tracheostomy. To prevent infection of the respiratory tract, a number of conditions must be observed:

- to provide humidification of the respiratory tract with a source of heated humidified air, especially at night,
- to take care of the oral cavity,
- when eating, you should not hurry to avoid getting food into the respiratory tract.
- change the equipment for artificial lung ventilation every 24 hours,
- to carry out a regular change of the cannula to a clean one three times a day,
- to carry out regular cleaning in the room where the patient is located.

The nurse, observing the patient, evaluates, first of all, his psychological state. When setting up a tracheostomy temporarily or permanently, it is difficult for the patient to talk normally, he needs to get used to new conditions and the way of breathing. In this case, it is necessary to explain that in order for the vocal cords to work, it is necessary to cover the opening of the tube with a finger wrapped with a sterile napkin. To communicate, you can give the patient a pen and paper. The patient faces a number of difficulties: this is both the inability to talk, and the presence of a defect, anxiety and fear of a new condition. The nurse, in turn, must choose a method of communicating with the patient, determine the possibilities of solving problems, train the patient to communicate and care for the tube. It is important to pay attention to contact with the patient's relatives or a nurse, who can also assist in monitoring and caring for the patient. A nurse can familiarize relatives with the rules of care. Talking to relatives is an integral part of care. The feeling that the situation is under control inspires psychological calmness to the patient's relatives and the patient himself. The latter has a positive effect on satisfaction with the quality of life.

Special care for the tracheostomy ensures the success of rehabilitation measures. It is aimed at preventing blockage of the tube with thick sputum and loss of the cannula of the inner tube, prevention of infection of the respiratory tract.

The nurse monitors the fixation of the tube. The external tube (cannula) of the tracheostomy has holes on the sides, for which it is fixed with ribbons to the patient's neck. To do this, the ribbons are passed through the holes twice and fixed with a knot. Under the ears of the external cannula, sterile wipes are placed on both sides. The wipes are changed several times a day with one-time treatment of the skin around the tracheostomy.

Special care includes:

- humidification of inhaled air;
- regular treatment and sanitation of the oropharynx;
- removal of tracheal contents through a tracheostomy tube;
- treatment and disinfection of the suction catheter;
- disinfection of the internal cannula;
- cleansing of the skin around the tracheostomy with the replacement of sterile wipes.

**Tracheostomy care algorithm.** Removal of tracheal contents through a tracheostomy tube:

I. Preparation for the procedure:

1. Explain to the patient and his relatives the purpose of the procedure.
2. Get verbal consent.
3. Prepare the necessary equipment and equipment.
4. Treat your hands with a hygienic product, drain.
5. Open the container with furacilin.
6. Prepare the electric pump.

II. Execution of the procedure — removal of contents from the trachea (sanitation):

1. Connect the catheter (the diameter of the catheter should be twice the diameter of the tube) to the electric pump system.

2. Turn the patient's head in the direction opposite to the direction of the «beak» of the catheter.

3. Insert the catheter as much as possible, until it stops, into one of the bronchi (when a cough appears, the catheter is suspended, and then it is continued during inhalation).

4. Install the catheter at the maximum distance from the stoma and rotate it around the axis clockwise and counterclockwise alternately (it is not recommended to move the catheter up and down, so as not to provoke a cough).

5. Turn on the electric pump (operating mode 100–120 mm Hg).

6. Remove the catheter after 5–10 seconds of aspiration. Rinse the catheter with a solution of furacilin from a sterile jar, without turning off the suction.

7. Turn off the electric pump.

8. Turn the patient's head in the opposite direction.

9. Insert a catheter into another bronchus and continue aspiration in the same way.

10. Remove the catheter from the respiratory tract by performing rotational movements with it.

11. Place medical supplies in a container with a disinfectant.

In the presence of thick mucus, 4–5 drops of solution for the rehabilitation of the tracheobronchial tree (isotonic solution, trypsin) are poured into the

tracheotomy tube. As prescribed by a doctor, 1 ml of an antibiotic is injected to prevent inflammation of the tracheal mucus (after a transference test).

**Internal cannula replacement and skin treatment.** In the first three days after the tracheostomy is applied, the internal cannula is replaced every two to three hours. In this case, the cannula is replaced with another one – a sterile one of the appropriate size. An error is the use of an internal cannula of an unsuitable size, which contributes to a rapid blockage of mucus. With a permanent tracheostomy, the internal cannula is replaced 2-3 times a day with tracheal sanitation and skin treatment:

1. After sucking out the mucus, remove the inner tube of the tracheotomy cannula.

2. Lubricate the prepared sterile inner tube of the tracheotomy cannula with a sterile napkin soaked in sterile vaseline oil.

3. Insert an inner tube of the appropriate size into the external tracheotomy cannula, lock it with a lock (metal tube is changed 3 times a day, plastic tube — 1 time a day).

4. Treat the skin and sutures around the cannula with balls moistened with 70 % alcohol (blotting movements to treat the sutures).

5. Cut the napkin to the middle on one side and put the cannula under the flap with the cut ends (change the napkins after 4–5 hours or as they get wet).

6. Close the tracheotomy opening of the cannula with a wet gauze cloth in the form of an «apron» moistened with 0.9 % sodium chloride solution to prevent the mucous membrane from drying out (moisten after drying).

III. End of the procedure:

1. Remove the gloves, place them in a disinfection container.

2. Treat your hands with a hygienic product, dry them.

3. Give the patient a comfortable position.

4. Make an entry in the medical documentation about the performance of the manipulation prescribed by the doctor.

The internal cannula should be decontaminated when removed from the trachea. It is washed with water, the inner surface is cleaned with a brush. It is disinfected with a solution of hydrogen peroxide or other disinfectant by soaking. At home, sterilization can be carried out by boiling a cannula and a brush for 30 minutes after boiling water. Keep clean cannulas in sterile wipes.

Control questions on the topic of the lesson:

1. List the main complaints of respiratory system damage.

2. List the main parameters of the state of the respiratory system.

3. Care for patients with dry cough.

4. Care for patients with cough with sputum.

5. Diagnosis of hemoptysis, pulmonary hemorrhage.

6. Emergency pre-medical care for patients with hemoptysis, with pulmonary hemorrhage.
7. Help the patient with chest pain.
8. The method of setting a warming compress.
9. Methods of collecting sputum for laboratory testing.
10. Disinfection of spittoons. Features of disinfection of spittoons in tuberculosis.
11. An idea of the methods of antiseptic equipment during diagnostic manipulations in pulmonology: mouthpieces (for spirometry and pneumotachometry), bronchoscope, catheter for bronchography.
12. Types of inhalers; purposes and methods of application.
13. Principles of care for patients with an installed tracheostomy tube.
14. Principles of care for patients with pleural drainage.

### **SELF-CONTROL OF MASTERING THE TOPIC**

**1. What are the main complaints in the patient with respiratory diseases:**

- a) secretion of purulent sputum;
- b) pain in the heart;
- c) shortness of breath when lying on the right side;
- d) chest pain;
- e) hacking cough.

**2. A patient with pleural disease takes forced position lying on the side of the lesion:**

- a) to relieve pain;
- b) to relieve shortness of breathe;
- c) to relieve the cough.

**3. What is the frequency of respiratory movements per minute in healthy people when awake:**

- a) 8–12;
- b) 10–16;
- c) 16–20?

**4. Emergency care for a patient in case of asthma attack includes:**

- a) providing access of fresh air;
- b) humidified oxygen supply;
- c) use of a pocket inhaler with bronchodilator?

**5. When changing the inner cannula:**

- a) cannula is disinfected;
- b) disinfection, sterilization of cannula and brush;
- c) just cannula sterilised.

**6. To prevent the infection of respiratory tract with a tracheostomy, it is necessary:**

- a) limit the patient's contact with other people;
- b) provide humidified air;
- c) take care of patient's oral cavity;
- d) regularly change the cannula to a clean one;
- e) regularly clean the room where the patient is located.

**7. Helping the patient with sputum separation includes:**

- a) performing postural drainage;
- b) supply of individual spittoon;
- c) saline inhalation;
- d) staging mustard plasters.

**8. First aid to a patient with pulmonary hemorrhage:**

- a) swallow ice cubes;
- b) apply an ice pack to the chest from the side of the affected lung;
- c) provide oxygen supply;
- d) inject etamsylate solution.

**9. Shortness of breathe in which inhalation is difficult:**

- a) inspiratory;
- b) expiratory;
- c) of physical tension;
- d) mixed.

**10. In oxygen therapy, in order to prevent the toxic effects of oxygen, it is necessary:**

- a) use an oxygen humidifier;
- b) comply with safety regulations;
- c) inhale as little as possible.

**11. What should be constantly monitored in patients with respiratory failure:**

- a) pulse rate, heart rate;
- b) breath rate;
- c) blood pressure;
- d) weight;
- e) level of consciousness;
- f) saturation.

**Answers:** 1 — a, d, e; 2 — a; 3 — c; 4 — a, c; 5 — b; 6 — b, c, d, e, 7 — a, b, c; 8 — a, b, c, d; 9 — a; 10 — a; 11 — a, b, f.

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С ЗАБОЛЕВАНИЯМИ ОРГАНОВ ДЫХАНИЯ**

**MEDICAL CARE OF PATIENTS WITH RESPIRATORY  
DISEASES**

Учебно-методическое пособие

На английском языке

Ответственный за выпуск Э. А. Доценко  
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