

Drohobych Ivan Franko State Pedagogical University

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**Physiobalneotherapy in case
of disorders of the cardio-respiratory system
and musculoskeletal system**

Methodological materials for practical lessons

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The methodological materials are prepared in accordance with the curriculum of the educational discipline "Physiobalneotherapy for disorders of the cardio-respiratory system and musculoskeletal system" for the training of specialists of the second (master's) level of higher education in the field of knowledge – 22 Healthcare, specialty 227 Therapy and Rehabilitation, approved by the Academic Council of Drohobych State Pedagogical University named after I. Franko. The methodological materials for practical sessions cover the issues of applying physical therapeutic factors in the treatment of disorders of the cardiorespiratory system and musculoskeletal system. This will help ensure a high level of knowledge, skills, and practical abilities of students in the application of physical therapeutic factors in cardiovascular, respiratory, and musculoskeletal disorders.

Bibliography of 11 sources.

**Дрогобицький державний педагогічний університет
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**Фізіобальнеотерапія при порушенні
діяльності кардіореспіраторної системи
і опорно-рухового апарату**

Методичні матеріали до практичних занять

Дрогобич, 2024

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Рекомендовано до друку вченою радою Дрогобицького державного педагогічного університету імені Івана Франка
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Методичні матеріали підготовлено відповідно до навчальної програми навчальної дисципліни "Фізіобальнеотерапія при порушеннях кардіореспіраторної системи та опорно-рухового апарату" для підготовки фахівців другого (магістерського) рівня вищої освіти галузі знань 22 Охорона здоров'я спеціальності 227 Терапія та реабілітація, затвердженої вченою радою Дрогобицького державного педагогічного університету імені Івана Франка.

У посібнику висвітлено питання застосування фізичних терапевтичних чинників у лікуванні порушень кардіореспіраторної системи та опорно-рухового апарату. Це сприятиме забезпеченню високого рівня знань, умінь і практичних навичок студентів у застосуванні фізичних лікувальних чинників при захворюваннях серцево-судинної, дихальної систем й опорно-рухового апарату.

Бібліографія з 11 джерел.

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List of abbreviations

IHD – is an ischemic heart disease

HD – is a hypertensive disease

FD – functional diagnosis

COPD – is a chronic obstructive lung disease

ICD-10 – medical classification of diseases 10th revision

ICF – International classification of functioning, limitations of vital activity and health

FVC – forced vital capacity

FEV1 – the volume of forced exhalation

DMW – Decimeter-wave therapy

BV – breathing exercises

RG – respiratory gymnastics

DB – diaphragmatic breathing

Introduction

The methodological materials are prepared in accordance with the curriculum of the educational discipline "Physiobalneotherapy for disorders of the cardio-respiratory system and musculoskeletal system" for the training of specialists of the second (master's) level of higher education in the field of knowledge – 22 Healthcare, specialty 227 Therapy and Rehabilitation. The concept of the educational discipline is to master theoretical knowledge and practical skills uses of physiobalneotherapy with individuals who have disorders of the cardio-respiratory system and musculoskeletal system.

The manual contains methodological developments for conducting 6 practical lessons. For each lesson, the goal is determined, a brief informational reference is provided, questions for self-preparation and control of the initial level of students' knowledge, and a list of recommended literature.

We hope that the methodological materials will help students independently prepare for each practical lesson in the educational discipline, promote the activation of independent work and the formation of self-education skills, the development of creative abilities, and their professional self-improvement.

GUIDELINES FOR PRACTICAL LESSON № 1
Physiobalneotherapeutic methods in the rehabilitation
of patients with ischemic heart disease at the outpatient
and sanatorium-resort stages of rehabilitation

Objective of the session:

- 1) Clinical-physiological justification for the use of physiobalneotherapy in ischemic heart disease (IHD).
- 2) Study of the mechanism of physiological and therapeutic effects of physical therapeutic factors and the objectives of physiobalneotherapy in IHD.
- 3) Mastery of methods for using therapeutic physical factors in IHD.

Main stages of the session

- I. Assessment of the initial level of knowledge (oral questioning).
- II. Discussion of the self-studied educational material.
- III. Completion of tasks and situational problems.

Theoretical information

Clinical-physiological justification for the use of physiotherapy in the rehabilitation of patients with cardiovascular diseases.

The therapeutic effect is realized through neuro-reflex and humoral mechanisms. The neuro-reflex action of natural and artificial physical therapeutic factors is associated with changes in the sensitivity of vascular chemoreceptors in the carotid and aortic zones and the coordinating function of the cerebral cortex, aimed at balancing processes of excitation or inhibition. As a result, reflexes arise that alter the tone of aortic and venous vessels, regulating arterial pressure and heart rate. The course administration of natural and artificial physical therapeutic factors in the rehabilitation process improves peripheral and coronary blood circulation, increases oxygen capacity of the blood, and enhances trophic processes in the myocardium or vascular walls.

Polyclinic stage of rehabilitation

At this stage of IHD rehabilitation, physiotherapeutic procedures with sedative effect, hypotensive effect, improvement of blood flow, oxygen saturation of the blood, immunomodulatory and general strengthening effects are used.

Electrosonotherapy. Impulse currents of rectangular shape with low frequency from 1–15 Hz and duration of 0.4 to 2 ms are used. Electrodes are applied using the ocular-temporal or frontal-temporal technique. The duration of the therapeutic procedure is 20–40 minutes, with a course of treatment consisting of 10–15 procedures, administered daily or every other day. During the procedure, the impulse currents suppress the activating influence of the reticular formation on the cerebral cortex, leading to enhanced internal inhibition. Accumulation of serotonin in the subcortical structures of the brain results in a decrease in conditioned-reflex activity and emotional activity. As a result of the course of treatment, vascular tone is normalized, oxygen capacity of the blood is increased, and the functional state of the blood coagulation and anticoagulation systems is improved.

General bromine electrophoresis according to S.B. Vermel. The procedure provides a qualitative sedative effect. A 2–5% solution of sodium or potassium bromide is used. The active electrode with a size of 15x20 cm is placed on the interscapular region, while two other electrodes with sizes of 10x15 cm are placed on the posterior surface of the shins. The current strength is 10–12 mA, and the duration of the procedure is 20–30 minutes. A course of treatment consists of 10–12 procedures, administered daily or every other day. For the same purpose, as well as for pain relief, electrophoresis of medicinal preparations is also used.

Medicinal electrophoresis. Sedative and tranquilizing drugs (2–5% solution of sodium or potassium bromide, 0.5% solution of seduxen), neuroleptics (1% solution of aminazine, 0.5% solution of haloperidol) are used. Under the influence of sedative drugs, tranquilizers, and neuroleptics, the sedative effect of direct current is enhanced. The method of application is the chamber technique according to Shcherbak.

The strength of the direct current is up to 8 mA, and the duration of the procedure is 20–25 minutes. A course of treatment consists of 10–15 procedures, administered daily or every other day.

Laser therapy. Low-intensity infrared laser radiation is used for the procedure. The technique is contact-stable, with a wavelength of 0.85 μm . The areas of influence include the collar zone, apex of the heart, middle third of the chest, and left subscapular region. Dosage: 1 minute for the areas of influence for the first 3 procedures, 2 minutes for procedures 4–6, 3 minutes for procedures 7–10. A course of treatment consists of 8–10 procedures, administered daily.

Hyperbaric oxygenation (HBO). The main mechanism of action of HBO is associated with a significant increase in the transport of oxygen under pressure to the tissues and is related to the physical properties of oxygen, which is capable of dissolving in blood plasma, allowing compensation for any myocardial hypoxia. In addition to increasing the oxygen-carrying capacity of the blood, the main factor of hyperbaric oxygen is the high partial pressure, which provides a significant increase in oxygen diffusion in areas of tissue with inadequate blood supply. This allows for the metabolic needs of the tissues to be met without increasing the volume of blood flow.

Sanatorium and resort stage of rehabilitation

Objectives at the sanatorium stage: normalize the functional state of the nervous system, improve myocardial trophic processes through adequate physical training of patients.

Diet: 10 or 15 or other according to additional indications (depending on the overall clinical condition), restricts the intake of animal fats and products containing cholesterol; should be easily digestible, well-cooked, and vitamin-enriched. A diet rich in omega-unsaturated fatty acids (sea fish) is recommended. In case of excess weight, the energy value of food is limited.

Sanatorium regime: I–II.

Climatotherapy: controlled walking routes (terrain walks with mandatory calculation of the overall load) within the sanatorium territory.

Exercise regimen: morning hygienic gymnastics, therapeutic exercises, controlled walking, walking tours.

Balneotherapy

Drinking balneotherapy using weakly mineralized (Naftusya) hydrocarbonate-siliceous mineral waters (from the Carpathians) with the aim of stimulating the immune system, normalizing metabolism, achieving optimal choleric and cholekinetic effects (formation and excretion of bile) to normalize cholesterol levels and lipid metabolism, as well as to increase diuresis.

"Dry" carbon dioxide baths, general carbon dioxide baths lasting 8–12 minutes. Carbon dioxide baths. The therapeutic effect on the patient is achieved by water saturated with carbon dioxide gas, with a concentration of 1.2–2.0 g/L, and the water temperature in the bath at the beginning of the procedure is 35–36°C, gradually decreasing to 32°C during the procedure. The patient's skin, immersed in water with carbon dioxide gas, is exposed to a two-phase environment of water and gas. This leads to an increase in the temperature of the body's "shell," resulting in a decrease in overall peripheral vascular resistance, enhanced renal blood flow and glomerular filtration, which contributes to a reduction in arterial pressure.

Iodobromine, oxygen, turpentine with white emulsion, pearl, and pine-pearl baths can be prescribed; the duration is individually selected based on the individual tolerance of the procedure; every other day or daily.

Oxygen baths. The concentration of oxygen is 30–40 mg/L, the temperature is 35–36°C, and the duration is 10–15 minutes. The procedure is performed four times a week or every other day, with a course of treatment consisting of 10–15 procedures. Oxygen bubbles poorly dissolve in water and quickly rise to the surface, entering the respiratory tract and thereby increasing blood oxygen saturation. As a result, the processes of oxygen absorption by the myocardium are enhanced, leading to improved trophic processes in the cardiac muscle.

Ozone baths. The therapeutic effect on the patient is achieved by fresh water saturated with ozone (O₃). The concentration of ozone in the bath at a temperature of 35–36°C is 30–40 mg/L. Ozone is delivered into the water through a system of metal pipes located at the bottom of the bath, which have numerous openings, using the VALKION apparatus for singlet oxygen therapy. Ozone penetrates well through the skin and activates oxygen utilization by the myocardium. By reacting with free radicals, ozone forms oxygen, which activates lipolysis and improves lipid metabolism. The duration of the procedures is 10–15 minutes, with a course of treatment consisting of 8–10 baths.

Pine baths and pine-pearl baths. 50–70 g of pine extract is dissolved in 200 L of fresh water. The bath temperature is 35–37°C, and the duration is 10–15 minutes, every other day, with a course of treatment consisting of 10–15 procedures.

Valerian baths. Valerian decoction (2 teaspoons per 200 mL of water) is added to 200 L of fresh water. The bath temperature is 35–37°C, and the duration is 10–5 minutes, every other day, with a course of treatment consisting of 10–12 procedures.

Gentle hydrotherapy procedures: rain shower at 28–30°C, light circular shower at 32–33°C, 1–2 minutes, daily.

Underwater shower massage. Conducted according to the general methodology. Special importance is given to the massage of reflexogenic zones (paravertebral and collar). During the underwater massage procedure, the water level in the bathtub should reach the mid-chest or nipple line. The water temperature in the bathtub is 35–36°C. The pressure of the massaging water stream is 1–1.5 atm. Massage techniques are used only in the form of stroking the entire body surface with slow movements from the periphery to the center, in accordance with the general rules of massage, which are performed in a horizontal plane and directed from the spine, from the lower segments to the upper ones. The procedure starts with the massage of the anterior surfaces of the body with the patient lying on their back. The massage is performed in the following sequence: first, the lower extremities are massaged from the foot area to the thighs on the outer and front surfaces, then the massage

of the abdomen is performed with circular movements clockwise and the right half of the chest, later moving on to the massage of both upper extremities from the wrist to the shoulder, and finishing with the massage of the collar zone in the area of the lower cervical and upper thoracic segments, including the upper part of the back and shoulders. The supraclavicular and subclavian areas are not subjected to massage. Activation of central thermosensitive neurons of the hypothalamus under the influence of hot air leads to a decrease in diastolic pressure and dilation of coronary vessels. Periodic exposure to various thermal factors of heat and cold increases the stability of central mechanisms regulating vascular tone, leading to stabilization of arterial pressure.

Physical therapy

General electrophoresis-galvanization according to Vermeil and electrophoresis of medicinal preparations: electrode with a pad of 15 by 20 cm in the interscapular region (anode), two other electrodes with pads of 10 by 15 cm (cathode) – on the posterior surface of the calves (on the calf muscles) for the administration of two different (of different polarity) medicinal substances; current strength up to 20 mA. The duration of the procedure is 15–20 minutes; for a course of treatment, 12–15 procedures (1% solution of aspirin or nicotinic acid).

Shcherbak's galvanic collar or electrophoresis of the collar zone (2% solution of papaverine hydrochloride, or 5% solution of novocaine, or 3% solution of sodium bromide or others).

Electrophoresis of bromine, or aminazine, or platyphylline, or magnesium, no-shpa, papaverine, beta-blockers.

1) *Electrotherapy with sinusoidal modulated currents (SMS)* or decimeter waves on the zone of segmental innervation of the heart or the precordial zone, or on the calf muscles: dose up to thermal or weakly thermal, 20–40 W, procedure duration up to 10 minutes daily or every other day, 15 procedures per treatment course.

DWT therapy on the zone of segmental innervation of the heart or the precordial (precordial) zone.

DWT therapy on the precordial zone, the emitter is positioned at a distance of 6–8 cm from the body surface. Dose up to thermal or weakly thermal, power 20 W (may be increased with satisfactory tolerance, but should not exceed 40 W), procedure duration up to 10 minutes daily or every other day.

Ultraphonophoresis (with nitrates or other medications) on the area of heart projection.

Additionally:

Electrosleep (with slight inhibition of frequency modulation, pulse frequency is individually selected, procedure duration up to 1 hour; with significant inhibition of frequency modulation (insomnia), procedure duration from 20 to 40 minutes); ocular electrodes (cathode) can be moistened with a solution of sodium bromide. Up to 15 procedures.

2) Laser therapy on reflexogenic zones, or on biologically active points, or internal laser blood irradiation.

3) Darsonvalization of the hairy part of the head or the collar zone.

4) UHF (ultra-high frequency electric field).

5) Microclimate therapy (halotherapy): with a preference for the presence of positive potassium ions in the aerosol (aerosol particle size up to 5 μm , aerosol density up to 5 mg/m^3 of air, duration of stay in aerosol conditions up to 30 minutes, every other day or daily.

6) Massage of the collar zone.

7) Individual or group psychotherapy.

8) Phytotherapy (selection of phytopreparations depending on the clinical features of the course of the main and concomitant pathologies).

Duration of sanatorium-resort treatment: 18–21–24 days.

Indicators of treatment quality: absence of clinical and ECG signs of myocardial ischemia. The essential signs of high risk of ischemia development according to the results of stress tests (ischemic ST segment depression > 2 mm, tolerance to physical exertion less than 5 METs or 75 W, decrease in systolic blood pressure during exercise); disappearance or reduction in frequency and intensity of angina attacks; increased tolerance to physical exertion; transition to a higher level of physical activity; improvement in analyses and diagnostic indicators, reduction in

frequency and dosage of antihypertensive medications, reduction in risk factors and meteoropathic reactions, improvement in overall well-being. Reduction in severity of patient complaints related to the cardiovascular system, correction of cardiovascular risk factors.

II. Questions for self-preparation and initial knowledge assessment

1. Justify the use of physiotherapy in the rehabilitation of patients with cardiovascular diseases.
2. Explain the objectives of physiobalneotherapy at the outpatient stage of rehabilitation for patients with coronary heart disease (CHD).
3. List the indications and contraindications for the use of physiobalneotherapy at the outpatient stage of rehabilitation for patients with CHD.
4. List the indications and contraindications for the use of physiobalneotherapy at the sanatorium-resort stage of rehabilitation for patients with CHD.
5. What is the main therapeutic mechanism of carbon dioxide baths in CHD?
6. Describe the main principles of balneotherapy in CHD.
7. What physical factors are used at the outpatient stage of rehabilitation for patients with CHD?
8. What is the main therapeutic mechanism of electrosonotherapy in CHD?
9. Characterize balneotherapy in CHD.

Task 2. Familiarize yourself and take note of the algorithm for prescribing physiotherapeutic factors in ischemic heart disease (IHD), using the recommendations of the Ministry of Health for protocol-based sanatorium-resort treatment of IHD.

Task 3. Solve situational problems.

Problem 1. A 62-year-old patient came to the polyclinic with complaints of heaviness and periodic squeezing pains behind the sternum

during physical exertion. The patient is on dispensary registration with a diagnosis of coronary heart disease, angina pectoris II FC. The patient is prescribed physical treatment factors. Highlight the clinical and physiological rationale for the use of physiotherapy, indicate the indications for the appointment of physiotherapy and the methodology and parameters of physiotherapy procedures

Problem 2. A 45-year-old patient is in the dispensary register with a diagnosis of coronary artery disease, angina pectoris and angina pectoris. Electrosonotherapy procedure was prescribed to the patient at the polyclinic stage of rehabilitation. Highlight the clinical and physiological rationale for the appointment of the procedure, the methodology, and its parameters.

Problem 3. Solve the situational problem. A 50-year-old patient with a diagnosis of coronary heart disease, angina pectoris I–II FC, NC I degree, who is in a sanatorium-resort rehabilitation, is prescribed carbon dioxide baths. Highlight the clinical and physiological justification of the appointment of the procedure, the mechanism of physiological and therapeutic action

Problem 4. A 42-year-old patient with a diagnosis of coronary heart disease, angina pectoris at rest, NK II A, is registered at the dispensary and went to the polyclinic with complaints of poor sleep, chest pains, and suffocation during physical exertion. Determine the indications and contraindications for the use of physical healing factors.

Task 4. Performance of test tasks for final control.

1. *Physiotherapy in the rehabilitation of patients with coronary artery disease is not indicated for:*

- a) atrioventricular block of the II degree;
- b) ventricular extrasystoles;
- c) Right bundle branch block.

2. *Electrophoresis of nitroglycerin on the anterior left chest wall may be prescribed for patients with ischemic heart disease (IHD) in the following cases:*

- a) Stable exertional angina of effort I–II functional class;

- b) stable angina of effort III–IV FC;
- c) Stable effort angina of functional class II with atrial fibrillation.

3. *DWT therapy may be prescribed to patients with stable angina pectoris due to ischemic heart disease.*

- a) I – IV FC;
- b) I – III FC;
- c) I – II FC;
- d) IV FC with grade II A circulatory insufficiency.

4. *Laser therapy is used for the treatment of patients with stable angina pectoris due to coronary heart disease (CHD).*

- a) with red radiation;
- b) with infrared radiation;
- c) with various ranges of radiation.

5. *Physiotherapy is not recommended for the rehabilitation of patients with CHD in the following cases:*

- a) stable angina pectoris of functional class (FC) III during exercise;
- b) stable angina pectoris of functional class (FC) IV during exercise;
- c) stable angina pectoris of functional class (FC) III with atrial fibrillation;
- d) unstable angina pectoris.

6. *Laser therapy is prescribed for patients with CHD and stable angina pectoris during exercise of:*

- a) FC I – II;
- b) FC I – III;
- c) FC I – IV.

7. *Low-frequency magnetotherapy is recommended for patients with CHD and stable angina pectoris during exercise of:*

- a) FC I – II;
- b) FC I – III;
- c) FC I – IV.

8. *The optimal treatment for patients with CHD and stable angina pectoris of FC III is:*

- a) electrophoresis of coronary vasodilators on the heart area using the transverse technique;

- b) general hydrogen sulfide baths;
- c) DMB therapy on the heart area;
- d) inductothermy on the left and back of the chest.

Correct answers to the tests

1	2	3	4	5	6	7	8
a	a	a	c	d	c	c	c

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GUIDELINES FOR PRACTICAL LESSON № 2

Physiobalneotherapy in the rehabilitation of patients with hypertension at the hospital, outpatient, and sanatorium stages of rehabilitation

Objective of the session: Clinical-physiological justification for the use of physiobalneotherapy in hypertension; studying the mechanism of physiological and therapeutic effects of physical therapeutic factors and the tasks of physiobalneotherapy in hypertension; mastering the techniques of using therapeutic physical factors in hypertension.

Main stages of the session

- I. Assessment of the initial level of knowledge (oral questioning).
- II. Discussion of the independently studied educational material.
- III. Completion of tasks and solving situational problems.

Theoretical information

Hypertensive disease (essential hypertension) is a persistent increase in systolic blood pressure (SBP) and/or diastolic blood pressure (DBP) to $\leq 140/90$ mmHg, caused by dysfunction of the central vascular regulatory centers, neurohumoral and renal mechanisms, without primary association with organic changes in the kidneys, brain, or endocrine system. In Ukraine, more than 14 million people suffer from hypertension. In 1999, the National Program for Prevention and Treatment of Arterial Hypertension was adopted. From 2010 to 2020, the country implemented the second program for the prevention and treatment of hypertension, cerebrovascular pathology, and its complications (MI, stroke) and improvement of quality of life.

Hospital stage of rehabilitation

Franklinization. For the procedure, the AF-3-1 apparatus is used, which consists of two electrodes, an upper one for the head and a lower one for the legs. The patient is in a sitting position. The upper electrode is placed above the head at a distance of 12–15 cm, and the patient stands

on the lower electrode, which is grounded, with their feet. They are exposed to a constant high-voltage electric field of 40–50 kV, under the influence of which air ions and chemical substances are formed in the air, which, in combination with the electric charge, penetrate through the skin, mucous membranes, and respiratory tract, causing dilation of the cerebral vessels, enhancing inhibitory processes in the cerebral cortex, and contributing to a decrease in arterial pressure.

Medicinal electrophoresis. Sedative and tranquilizing drugs are used (2–5% solution of sodium or potassium bromide, 0.5% solution of seduxen, 1% solution of elenium), neuroleptics (1% solution of aminazine, 0.5% solution of haloperidol). Under the influence of sedative drugs, tranquilizers, and neuroleptics, the sedative effect of direct current is enhanced. The Shcherbak cell method is used. The strength of the direct current is up to 8 mA, the duration of the procedure is 20–25 minutes, for a course of treatment 10–15 procedures, daily or every other day.

General bromine-caffeine electrophoresis according to S.B. Vermel. An active double electrode with pads of 10×15 cm is placed on the interscapular region. One electrode is moistened with a 5–10% solution of sodium bromide, the other with a 1% solution of caffeine-sodium benzoate, two other electrodes are placed on the back surface of the shins. The current strength is 10–15 mA, the duration of the procedure is 10–20 minutes. For a course of treatment, 10–12 procedures are performed daily or every other day.

Magnesium electrophoresis according to Shcherbak. One electrode with a collar pad is placed on the back of the neck and on the sides, covering the upper part of the back and shoulders. The second electrode with a pad of 20×25 cm is moistened with a 2–5% solution of magnesium sulfate and placed transversely. The current strength is 15–30 mA, the duration of the procedure is 10–20 minutes, for a course of treatment 10–12 procedures, daily or every other day.

Diadynamic therapy of the upper and lower cervical sympathetic nodes

A. Diadynamic therapy of the upper cervical sympathetic nodes. The patient is seated, a double electrode is used, the lower end (cathode) of which is placed 2 cm behind the angle of the lower jaw, and the upper end (anode) is placed 3 cm above the lower end of the electrode. A biphasic current is used with a strength that produces a vibration sensation and irradiation in the ear area. The duration of the procedure is 3 minutes, for a course of treatment 8–10 procedures, daily or every other day.

B. Diadynamic therapy of the lower cervical sympathetic nodes. A double electrode is used, the lower end (cathode) of which is placed on the inner third of the clavicle, and the upper electrode (anode) is placed on the sternoclavicular-mastoid muscle. A biphasic current is used with a strength that produces a vibration sensation along the cervical plexus and heaviness in the shoulder. The duration of the procedure is 3 minutes, for a course of treatment 8–10 procedures, daily or every other day.

Sinus-modulated current for the cervical sympathetic nodes.

Round electrodes with a diameter of up to 3 cm are used, which are placed paravertebrally: the first electrode is placed at the level of the CIII–ThII cervical-thoracic segments, and the second electrode is placed 2 cm higher. The mode is alternating, the first type of work, the current frequency is 150 Hz, and the modulation depth is 50–75% for 5 minutes, with a duration of stimulation and pause of 2–3 seconds. The treatment course consists of 10–12 procedures daily or every other day.

Decimeter-wave therapy (DMW) on the collar zone. A rectangular emitter is used, which is placed at the level of the CIV–ThII segments at a distance of 3–4 cm from the affected area, with a radiation power of 30–40 W and a procedure duration of 10–12 minutes. The treatment course consists of 10–12 procedures daily or every other day.

Laser therapy. Low-intensity infrared laser radiation is used. The technique is contact-stable, with a wavelength of 0.85 μm , and the areas of influence include the collar zone, apex of the heart, middle third of the

sternum, and left scapular region. The dosage is 1 minute for the areas of influence for 1–3 procedures, 2 minutes for 4–6 procedures, and 3 minutes for 7–10 procedures, with a treatment course consisting of 8–10 procedures daily.

Inductothermy (high-frequency magnetotherapy). An inductor disk is used, which is placed in contact or an inductor cable is placed remotely at a distance of 1.5–2 cm from the affected area at the level of the ThX–LIV segments. The current strength is up to 250 mA, with a low thermal dose and a procedure duration of 30–60 minutes. The treatment course consists of 10 procedures daily.

Decimeter-wave therapy (DMW) on the kidney area. The technique is remote, using a rectangular emitter placed 3–4 cm above the kidney area at the level of ThX–LIII, with a current power of 35–40 W and a procedure duration of 10 minutes. The treatment course consists of 10–15 procedures daily.

Ultrasound on the kidney area. Continuous ultrasound is applied paravertebrally on the kidney area at the level of ThX–LIII with an intensity of 0.4–0.6 W/cm². The duration of each field of influence is 3–5 minutes, with a treatment course consisting of 10–15 procedures daily.

Sinus-modulated currents (amplipulse therapy). One electrode with an area of 100 cm² is placed in contact paravertebrally above the kidney area at the level of ThX–LIII, and the second electrode with an area of 300 cm² is placed in contact on the abdominal area. The III–IV type of work is used with a frequency of 70–100 Hz and a modulation depth of 100%, applied for 3–5 minutes on each field of influence. The treatment course consists of 12–15 procedures daily or every other day.

Outpatient rehabilitation stage

Prolonged aerotherapy. This refers to extended exposure to fresh air, including sleep, under a weak or moderate aerotherapy regimen.

Air baths – controlled exposure of the fully or partially exposed patient to fresh air. Depending on the season and weather, these baths are taken in rooms with open windows, verandas, balconies, or in special climate pavilions or tents by the seaside. The dosage of air baths is

administered according to specific cold load regimens (the difference between heat dissipation and heat production, relative to body surface area). The duration of the procedures ranges from 10 minutes to 1.5 hours, with a treatment course consisting of 10–20 procedures.

Carbon dioxide baths. Therapeutic effects on the patient are achieved through water saturated with carbon dioxide gas, with a concentration of 1.2–2.0 g/L and a water temperature in the bath starting at 35–36°C, gradually decreasing to 32°C during the procedure. The patient's skin, immersed in water with carbon dioxide gas, is exposed to a two-phase environment of water and gas. Gas bubbles form a thermoprotective gas layer on the patient's body, which hinders direct heat exchange between water and the body through conduction. This leads to an increase in the temperature of the body's "shell," resulting in a decrease in overall peripheral vascular resistance, enhanced renal blood flow, and glomerular filtration, contributing to a reduction in arterial pressure.

For patients with complicated hypertension, "dry" carbon dioxide baths are used instead of general carbon dioxide baths. These baths lack the hydrostatic pressure of water and the penetration of carbon dioxide gas through the respiratory tract. Procedure methodology: General carbon dioxide baths: carbon dioxide concentration of 1.2–2.0 g/L, temperature of 35–36°C, duration of 10–15 minutes, every other day, with a treatment course consisting of 10–12 procedures. "Dry" carbon dioxide baths: carbon dioxide gas concentration of 30–60%, temperature of the steam-air mixture at 28–32°C, procedure duration of 15 minutes, with a treatment course consisting of 10–12 procedures daily.

Radon baths. Methods of carrying out procedures. General radon baths. radon concentration 40–120 nKu/l, temperature 35–36°C, duration 10–12 minutes. Baths are performed every other day or two in a row with a further day of rest, for a course of 10–14 procedures. The main active factor of these baths is the dissolved inert gas radon (Rn) and its decay products (polonium, thoron, actinon), the formation of which is accompanied by alpha radiation. Under the action of radon baths, biphasic changes in local blood circulation in tissues occur, a kind of

"training" of blood vessels. At the beginning of taking a bath, a short-term spasm of blood vessels occurs for 1–3 minutes. is changed by their long-term expansion. Radon baths cause shortening of systole and lengthening of diastole with unchanged heart rate (HR). Radon alpha radiation leads to an increase in the content of high-density lipoproteins in the blood.

"Dry" radon baths. Radon concentration 40–80–120 nKu/l, temperature 35–36 °C, duration 10–12 minutes. At the beginning of the treatment, a radon concentration of 40 nKu/l is used, a day after two or three baths, the concentration is increased to 80 nKu/l, the baths are carried out two days in a row followed by a day of rest, for a course of 10–14 procedures.

Hydrogen sulfide baths. The concentration of hydrogen sulfide is 50–150 mg/l, the temperature is 35–36°C, the duration is 10–12 minutes, every day or two in a row, followed by a day of rest, for a course of 10–12 baths. The first baths are used with a hydrogen sulfide concentration of 50 or 75 mg/l. with further increase. Therapeutic effect on a patient immersed in water saturated with hydrogen sulfide. Hydrogen sulfide, as a strong reducing agent, acts as a natural antioxidant, as a result of which the synthesis of low-density lipoproteins, which have a pronounced atherogenic effect, decreases. By reducing the aggregation ability of platelets, hydrogen sulfide improves the rheological properties of blood, causes relaxation of the smooth muscles of coronary and peripheral vessels, thereby reducing the load on the heart muscle and reducing oxygen consumption by the myocardium.

Chloride-sodium baths. Water mineralization 20–30 g/l, temperature 35–36°C, duration 10–12 minutes. The content of sodium chloride is 18 g/l, iodine salts 0.024 g/l, bromine – 0.18. Procedures are carried out every other day or two in a row, with a further day of rest, for a course of treatment of 10–12 procedures. During the procedure, 140–190 µg of iodine (I) and 0.28–0.3 mg of bromine (Br) enter the body through the skin, which, entering the bloodstream, selectively accumulate in the thyroid gland (I), pituitary gland, and hypothalamus (Bg). At the same time, the chemoreceptors of the vessels are excited, which leads to the

formation of a system of blood circulation reactions. As a result, the patient's muscle tone and blood pressure decrease, heart rate decreases along with an increase in stroke volume and volume of circulating blood, selectively increases blood circulation in the kidneys. Iodine ions, entering the follicles of the thyroid gland with the help of active transport, form physiologically active thyroid hormones – thyroxine and triiodothyronine, restore the basic metabolism in the body. They stimulate protein synthesis and oxidation of carbohydrates and lipids, which leads to an increase in the blood of high-density lipoproteins, which prevent the deposition of lipids in the vascular wall. In addition, iodine ions increase the fibrinolytic activity of blood, suppressed in atherosclerosis, and reduce its coagulation properties.

Nitrogen baths. The concentration of nitrogen in the baths is 21–23 mg/dm³, the water temperature is 35–36°C, the duration of the procedure is 10–12 minutes. Nitrogen baths have a sedative effect on the central nervous system, cause positive changes in central hemodynamics, improve indicators of lipid metabolism, reduce blood coagulability and activate the fibrinolysis system.

Valerian baths. Valerian decoction (2 teaspoons per 200 ml of water) is added to 200 liters of fresh water. Bath temperature 35–37°C, duration 10–15 minutes, every other day, 10–12 procedures per course of treatment.

Sauna therapy. Methodology and sequence of the procedure. Before entering the sauna, the patient takes a hygienic shower with soap, then dries the body with a towel and enters the thermal chamber. During the procedure, patients are in the thermal chamber no more than 2 times.

The first stay in the thermal chamber on the lower shelf should last 7–10 minutes. Leaving the thermal chamber is accompanied by cooling the body under a shower with a water temperature of 36°C, followed by a 20–30 minute rest. at an air temperature of 22–23°C.

The second stay in the thermo-chamber is possible on the lower or upper shelf for 7–10 minutes, followed by body cooling under a shower with water temperature of 34–35°C for 3–5 minutes and a rest period of 30–40 minutes at an air temperature of 22–23°C.

Sauna therapy procedures are prescribed once a week, for a treatment course of 5–10 sessions, lasting 1–3 months.

Sanatorium treatment for stage 1 and 2 of benign course of hypertension without frequent hypertensive crises

In other cases of hypertension with frequent hypertensive attacks or malignant course, complicated by a stroke or myocardial infarction, sanatorium treatment with physio-balneotherapy is contraindicated.

Diet: 10 or 15; it should be easily digestible, well-cooked, vitamin-enriched, containing animal protein, dairy products, 30–40% plant-based fat, and fruit-containing products. The energy value of food is limited in case of excess weight.

Sanatorium regime: I–II.

Climatotherapy: controlled walking routes (terrain walks) within the sanatorium area, fresh air and sun baths, etc.

Physical activity: morning hygienic gymnastics, therapeutic exercises, controlled walking, training on a stationary bicycle, walking, terrain walks, controlled skiing, circuit training, classical and segmental massage, self-massage, acupressure massage.

Balneotherapy

4-chamber baths, "dry" carbon dioxide, general carbon dioxide, iodobromine, oxygen, or naphthalan baths, pearl baths, coniferous-pearl baths, hydrogen sulfide baths, baths with bischofite. Light circular shower is recommended, underwater shower-massage using a gentle technique; light therapeutic swimming in a pool under the supervision of an instructor.

Physical therapy equipment

Shcherbak's galvanic collar or galvanic electrophoresis of the collar zone (2% solution of papaverine hydrochloride, or 5% solution of novocaine, or 3% solution of sodium bromide or others).

General electrophoresis-galvanization according to Vermel (1% solution of aspirin or nicotinic acid), or transcordial electrophoresis (5% solution of novocaine or 1% solution of nicotinic acid).

Electrophoresis of bromine, or aminazine, or platyphylline, or magnesium, no-shpa, papaverine, beta-blockers.

1) *Electrotherapy with sinusoidal modulated currents (SMS)* or decimeter-wave electrotherapy on the zone of segmental inertia of the heart or atrial zone, or on the calf muscles: dose up to thermal or weakly thermal, 20–40 W, duration of the procedure up to 10 minutes daily or every other day, 15 procedures per course of treatment.

Magnet therapy on the zones of segmental innervation of the heart.

Additionally:

1) Electrosleep (with a slight weakening of the inhibition processes, the frequency of pulses is selected individually, the duration of the procedure is up to 1 hour; with a significant weakening of the inhibition processes (in case of insomnia), the duration of the procedure is from 20 to 40 minutes); eye electrodes (cathode) can be moistened with sodium bromide solution. Up to 15 procedures.

2) laser therapy on reflexogenic zones, or on biologically active points, or internal laser irradiation of blood.

3) D'arsonvalization of the hairy part of the head or the collar zone.

4) UHF (ultra high frequency electric field).

5) Microclimate therapy (halotherapy): with the advantage of the presence of potassium positive ions in the aerosol (aerosol particle size up to 5 μ m, aerosol density up to 5mg/m³ of air, duration of exposure to aerosol conditions up to 30 minutes, every other day or daily.

6) collar zone massage.

7) Individual or group psychotherapy.

8) Phytotherapy (selection of phytopreparations depending on the clinical characteristics of the course of the main and concomitant pathology).

The term of sanatorium-resort treatment: 18–21–24 days.

Sanatorium-resort treatment of renovascular hypertension after reconstructive operations on the renal arteries and kidneys, with

normalization or significant reduction of blood pressure after surgery, without pronounced disturbances of cerebral and coronary circulation. In the presence of heart failure, not exceeding stage 1, and the absence of prognostically unfavorable cardiac rhythm disorders.

ICD-10 code: I 15.

Diet: 10 or 15 or other as indicated by additional criteria (depending on the overall clinical condition), restricts the intake of animal fats and cholesterol-containing products; should be easily digestible, with good culinary processing, and vitamin-enriched. A diet rich in omega-unsaturated fatty acids (marine fish) is recommended. In case of excess weight, the energy value of food is limited.

Sanatorium regime: I–II.

Climate therapy: dosed walking routes (terrain walks) on the territory of the sanatorium, air and sun baths, and others.

Physical activity regime: morning hygienic gymnastics, therapeutic dosed walking, walking excursions.

Balneotherapy.

4-chamber baths, carbon dioxide or "dry" carbon dioxide baths, iodobromine, saline, oxygen, or pearl baths, pine-pearl baths, light circular or rain showers, or pouring.

Physical therapy

Galvanic collar according to Shcherbak or electrophoresis of the collar zone (2% solution of papaverine hydrochloride, or 5% solution of novocaine, or 3% solution of sodium bromide, 1% solution of eufhyllin or others).

General electrophoresis-galvanization according to Vermel (1% solution of aspirin or nicotinic acid), or electrophoresis of bromine, aminazine, platyphylline, magnesium, no-shpa, papaverine, beta-blockers.

Electrotreatment with sinusoidal modulated currents (SMC) or decimeter waves on the zone of segmental inertia of the heart or precardiac zone, or on the calf muscles: dose up to thermal or weakly

thermal, 20–40 W, procedure duration up to 10 min daily or every other day, 15 procedures per treatment course.

Additionally:

1) Electrosleep (with slight inhibition of braking processes, the pulse frequency is individually selected, procedure duration up to 1 hour; with significant inhibition of braking processes (insomnia), procedure duration from 20 to 40 min); ocular electrodes (cathode) can be moistened with a solution of sodium bromide. Up to 15 procedures.

2) Laser therapy on reflexogenic zones or on biologically active points, or internal laser irradiation of blood.

3) Massage of the collar zone.

4) Individual or group psychotherapy.

5) Phytotherapy (selection of phytopreparations depending on the clinical features of the course of the main and concomitant pathologies).

Duration of sanatorium treatment: 18–21–24 days.

Quality of treatment indicators: stabilization of blood pressure levels and/or a stable tendency towards its reduction; increased tolerance to physical and mental stress, transition to a higher level of physical activity; improvement in laboratory tests and diagnostic indicators, reduction in the frequency and dosage of antihypertensive medications, reduction in risk factors and weather-related reactions, improvement in overall well-being. Persistent reduction in blood pressure to the target level of < 140/90, and for patients with diabetes – < 130/80. Reduction in severity of cardiovascular complaints, correction of cardiovascular risk factors.

Task 1. Master the algorithm for prescribing physiotherapeutic factors in the treatment of hypertension during hospitalization, outpatient care, and sanatorium-resort rehabilitation stages.

Task 2. Solve situational problems.

Problem 1. A 60-year-old patient with a diagnosis of stage II hypertension is admitted to the day hospital and complains of headaches, dizziness, and periodic dull pain in the chest area. What balneotherapy

can be recommended in this case? Provide a clinical-physiological rationale for such a procedure.

Problem 2. A 55-year-old patient with a diagnosis of stage II hypertension and periodic hypertensive crises is in the hospital rehabilitation stage and complains of irritability, periodic dull pain in the chest area, and shortness of breath during physical exertion. The patient has been prescribed electrosleep and electrophoresis with sedative medications. Provide a clinical-physiological rationale for the prescribed procedures and determine the methodology for prescribing the electrosleep procedure.

Problem 3. A 45-year-old patient with a diagnosis of stage I–II hypertension is in the hospital rehabilitation stage and complains of chest pain and headaches. The patient has been prescribed laser therapy. Provide a clinical-physiological rationale for the prescription of the procedure and describe its therapeutic effects.

Problem 4. A 45-year-old patient with a diagnosis of stage I–II hypertension is undergoing sanatorium-resort rehabilitation. There are no complaints. The patient has been prescribed sauna therapy. Provide a clinical-physiological rationale for the prescription of the procedure and describe its methodology.

Problem 5. A 50-year-old patient with a diagnosis of stage I–II hypertension is undergoing sanatorium-resort rehabilitation. There are no complaints. The patient has been prescribed balneotherapy (baths). Determine the type of balneotherapy, provide a clinical-physiological rationale for the chosen type of balneotherapy, and explain its mechanism of therapeutic action.

Task 6. A 47-year-old patient with a diagnosis of essential hypertension, osteochondrosis of the thoracic and lumbar spine, is undergoing sanatorium-resort rehabilitation. Underwater shower massage has been prescribed. Justify the appointment of the procedure and its implementation technique.

Task 3. Self-preparation and initial knowledge assessment questions.

- 1) What are the objectives of physiotherapy in the rehabilitation of patients with hypertension?
- 2) In what course of essential hypertension is physiotherapy prescribed?
- 3) What complications of hypertension are contraindications for the prescription of physiotherapy?
- 4) What physiotherapy procedures are used during the hospital stage of rehabilitation in hypertension?
- 5) What physiotherapy procedures are used during the outpatient stage of rehabilitation in hypertension?
- 6) What balneological procedures are effective during the outpatient stage of rehabilitation in essential hypertension?
- 7) What physiotherapeutic procedures are recommended during the sanatorium stage of rehabilitation in hypertension?
- 8) What balneological procedures are effective during the sanatorium-resort stage of rehabilitation in essential hypertension?
- 9) What are the contraindications for sanatorium rehabilitation in essential hypertension?
- 10) What physical factors are used in the sanatorium treatment of symptomatic hypertension in kidney diseases?

Task 4. Completion of test tasks for final assessment.

1. Physiotherapy can be prescribed for stage II hypertension combined with:

- a) paroxysmal arrhythmia;
- b) atrial extrasystole;
- c) atrioventricular block of stage III;
- d) stage III circulatory insufficiency.

2. In stage II hypertension with hypokinetic hemodynamics (reduced cardiac output and increased total peripheral vascular resistance), the optimal method is:

- a) DMC therapy on the collar zone;

- b) high-frequency magnetotherapy on the kidney area;
- c) UHF therapy on the synocarotid zone.

3. Laser therapy is prescribed for patients with stage II hypertension with the following hemodynamic variant:

- a) hypokinetic;
- b) hyperkinetic;
- c) eukinetic;
- g) in different variants.

4. Electrosurgery is not prescribed for patients with stage II hypertension in the following cases:

- a) hypokinetic variant of hemodynamics;
- b) hyperkinetic variant of hemodynamics;
- c) eukinetic variant of hemodynamics;
- d) grade II circulatory insufficiency.

5. Physiotherapy is contraindicated in the following cases:

- a) stage I hypertension with paroxysmal atrial fibrillation and first-degree circulatory insufficiency;
- b) post-infarction atherosclerosis (myocardial infarction two years ago) with stage I circulatory insufficiency;
- c) stage I hypertension with paroxysmal ventricular tachycardia.

6. The optimal method for patients with stage II hypertension and hyperkinetic variant of hemodynamics (increased cardiac output with normal total peripheral vascular resistance) is:

- a) UHF therapy on the kidney area;
- b) low-frequency magnetotherapy on the collar zone;
- c) sauna.

7. For patients with stage I hypertension complaining of irritability and poor sleep, the following physiotherapy method is recommended:

- a) local Darsonvalization on the left front chest;
- b) general Franklinization;
- c) amplipulsetherapy of the collar zone;
- d) hydrogen sulfide baths.

8. Sauna therapy is indicated for patients with hypertension:

- a) stage I;

- b) stages I–II;
- c) stages II–III.

9. What is the recommended physical activity regime during the sanatorium stage of rehabilitation:

- a) RR II;
- b) RR I–II;
- c) RR III.

Correct answers to the tests

1	2	3	4	5	6	7	8	9
a	b	d	d	a	a	a	c	b

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GUIDELINES FOR PRACTICAL LESSON № 3

General principles of applying physioalneotherapeutic factors in respiratory system diseases

Objective of the session: Clinical and physiological justification of the use of physioalneotherapy factors in diseases of the respiratory organs; study of the mechanism of physiological and therapeutic action of physical therapeutic factors and tasks of physioalneotherapy in diseases of the respiratory system; mastering the methods of using therapeutic physical factors in diseases of the respiratory organs.

Main stages of the session

- I. Assessment of the initial level of knowledge (oral questioning).
- II. Discussion of the self-studied educational material.
- III. Completion of tasks and solving situational problems.

Theoretical information

The respiratory system is important for supporting life through gas exchange and also functions as a vocal apparatus. The respiratory system includes: nasal cavity, pharynx, larynx, trachea, bronchi and their branches, and lungs. At the level of the 6th–7th cervical vertebrae, the larynx transitions into the trachea, which in males may be slightly lower and in females may be higher. Taking the beginning in the lower neck area, the trachea continues downwards – this is the cervical part, then transitions into the thoracic cavity – the thoracic part. At the level of the 4th thoracic vertebra, the trachea divides into the right and left primary bronchi. The bronchi diverge asymmetrically, with the right bronchus being shorter (3 cm in length), but wider and branching off from the trachea at an obtuse angle; the left bronchus is longer (4–5 cm in length), narrower, and branches off from the trachea at almost a right angle. Each bronchus enters the corresponding lung, where it branches out, forming the bronchial tree. The right bronchus gives rise to 3 branches, while the left bronchus gives rise to 2 branches. Each branch brings air to the lungs; subsequently, each bronchus further divides, and the branches of

the bronchi decrease in diameter. The small branches, with a diameter of about 1 mm, are called bronchioles. Bronchioles branch out into 12–18 terminal bronchioles, which in turn divide into respiratory bronchioles. Respiratory bronchioles bring air to small areas of the lungs called acini. The total number of alveoli-acini in each lung reaches hundreds of millions; the total length of their respiratory surface is hundreds of square meters. The lungs are paired organs surrounded by the right and left pleural sacs, occupying the majority of the thoracic cavity. Each lung, both right and left, has the shape of a truncated cone; the apex of the lung is directed upwards towards the supraclavicular region, and the base of the lung is located on the diaphragm. The right lung is wider but slightly shorter than the left lung. The left lung has a cardiac notch in the lower part of the anterior border – a space for the heart. The lungs are divided into so-called bronchopulmonary segments. A bronchopulmonary segment represents a region of a lung lobe that is ventilated by one bronchus and supplied by one artery.

FVC Research

Spirometry is mandatory for diagnosing chronic lung diseases, it is necessary for assessing the severity of the disease and for periodic monitoring to evaluate disease progression.

For patients with mild to moderate lung diseases, there is a slight decrease in both FEV1 and forced vital capacity (FVC). After taking a bronchodilator, an FEV1 < 80% with an FEV1/FVC ratio < 70% confirms the presence of partially reversible airway limitation. If spirometry is not possible, a prolonged forced expiration of more than 6 seconds is a rough but useful predictor of a decreased FEV1/FVC ratio < 50%.

As the disease progresses, bronchial obstruction increases, overall airway resistance increases, expiratory lung hyperinflation occurs and worsens, and air trapping in the lungs develops due to loss of lung elasticity and collapse of airways, leading to a redistribution of lung capacity.

Annual spirometry is performed to monitor the progression of respiratory organ pathology and evaluate the effectiveness of treatment

interventions in individual patients. In healthy individuals, an annual decrease in FEV1 is < 30 mL, while in patients with COPD, it is 30–60 mL or more.

Arterial blood gas measurements are performed in patients with an FEV1 < 40% of predicted or in the presence of clinical manifestations of respiratory insufficiency or right heart failure.

Hospital rehabilitation stage for respiratory organ diseases

According to various authors, the main principles of therapy for respiratory organ diseases include gradual escalation of treatment intensity based on the severity of the disease, regularity and consistency of basic therapy according to the disease severity, and variability of individual response to treatment, which necessitates careful and regular monitoring of clinical and functional signs of the disease [6, 7].

What do the majority of pulmonologists recommend? In their opinion, the preferred route of administration for the treatment of respiratory organ diseases is inhalation of medications – bronchodilators, inhaled corticosteroids, combined preparations. When prescribing high doses of medications and to improve inhalation technique, the use of large volume spacers is recommended. The use of nebulizers allows for the use of high doses of medications and obtaining a therapeutic response in a short period of time, as well as simultaneous delivery of oxygen to the circuit (if needed).

Recommended physiotherapy procedures during the hospital stage

DWT therapy for the interscapular area. The emitter is installed with a gap of 5 cm, power 20–30 W, procedure duration 10–15 minutes daily for a course of 10–12 procedures. The procedure increases the temperature of the lung tissue, improves blood and lymph circulation, which leads to resorption of inflammatory infiltrate in the lungs and improvement of external respiration function.

Ultrasound for the chest area. It is performed in a lying position. The surface of the chest is divided into 6 fields: right and left anterior surface of the chest, right and left fields behind the chest, and two lateral

fields. Two fields are treated per day, excluding the area of the heart and sternum. The mode is continuous, the technique is moving, the dose is 0.2–0.4 W/cm², 3 minutes per field, daily or every other day, for a course of 6–8 procedures. The ultrasound is applied segmentally-paravertebrally and above the lesion focus along the intercostal spaces, the technique is labile, 10–12 minutes per area. The ultrasound eliminates bronchial and alveolar spasms, promotes resorption of exudate, preventing the formation of pleural adhesions.

Electrophoresis of antibiotics. Internal organ electrophoresis can be performed at high temperature, when medications are administered intravenously in the physiotherapy department or intramuscularly 20 minutes before the electrophoresis procedure. It acts on the projection area of pneumonia, current strength 3–5 mA, course duration 6–8 procedures, daily.

Ultrasonic inhalations of antibiotics. Antibiotics are used depending on the sensitivity of the bronchial secretions microflora. For one inhalation, antibiotics are dissolved in 10–20 ml of distilled water, 2–3 inhalations are performed throughout the day, for a course of treatment of 6–8 days.

Laser irradiation of blood. Optical irradiation in the infrared range is used, affecting the area of the projection of the elbow vein. The technique is stable, with an irradiation pulse power of 4–10 W, a frequency of 50 Hz, a procedure duration of 8–12 minutes, daily or every other day, for a course of 8–12 procedures. Under the influence of laser irradiation, the bactericidal activity of blood serum is enhanced, the level of immunoglobulins and oxygen capacity of blood increases, and the level of free heparin in blood serum increases, leading to inhibition of thrombus formation.

Task 1. Master the main tasks that pulmonologists face when prescribing physiotherapeutic factors for respiratory organ pathology at the hospital stages of rehabilitation [3].

Main tasks of the respiratory organ pathology rehabilitation department

1. Implementation of high-quality restorative treatment for patients with respiratory organ pathology according to individual rehabilitation programs in accordance with current standards, clinical protocols of rehabilitation treatment with the aim of:

- elimination or reduction of inflammation of the respiratory organs;
- restoration or improvement of impaired respiratory organ functions;
- normalization of adaptive-compensatory mechanisms and increase in overall body reactivity;
- increase in work capacity, physical and mental activity of patients and their preservation.

2. Adherence to the basic principles of rational use of therapeutic physical factors:

- correctness, completeness and clear formulation of the diagnosis with mandatory indication of the clinical form of the disease, its stage, the presence and nature of complications;
- application of physical resort factors should be consistent at all stages of rehabilitation measures;
- application of physical resort factors should be etiological and pathogenetically justified;
- the choice of the procedure technique should be strictly differentiated, taking into account the characteristics of the nature, main clinical manifestations or traumatic injuries, individual features of the state of reparation processes and the disease plan, the initial functional state of the patients;
- Systematic medical monitoring of the state of reparative processes, corresponding reactions of the patient's body, based on data from both immediate and long-term consequences of the application of physical factors;
- Proper clinical interpretation of the detected reactions for timely correction of therapeutic measures.

3. Timely provision of emergency and urgent care to patients with transportation, if necessary, to appropriate specialized stationary facilities.

4. Establishing a connection with other healthcare institutions, involving specialists from other fields in the rehabilitation process, if necessary.

5. Providing consultative and methodological assistance in medical rehabilitation.

6. Mastering and implementing new methods of restorative treatment using natural and preformed factors in the practice of the department.

7. Increasing the level of theoretical and practical knowledge, systematic training of department personnel, improving their professional training, including all major scientific, theoretical, and organizational-practical aspects of medical rehabilitation.

Task 2. Familiarize and study the methods of rehabilitation treatment for respiratory organ diseases at the sanatorium stage, indications and contraindications for such treatment.

Methods of rehabilitation treatment for respiratory organ diseases at the sanatorium stage

The main functions of the rehabilitation department for respiratory organ pathology.

1. Ensuring the possibility of consolidating previously achieved positive treatment results, further restoration of impaired functions and compensation for losses due to the disease, prevention of balneological reactions and relapses in the sanatorium, as well as in the remote period of the disease.

2. Providing opportunities and quality control of physical and physiological rehabilitation, improving and shortening the patient's adaptation time.

3. Providing opportunities for social and vocational rehabilitation of the patient, monitoring the restoration of work capacity and improving the quality of life.

4. Determining the effectiveness of medical rehabilitation according to effectiveness criteria, analyzing and summarizing the obtained data, developing recommendations for improving treatment effectiveness.

Indications and contraindications for referral to the rehabilitation department

Medical indications for referral of patients with respiratory organ pathology to the rehabilitation department.

Respiratory organ diseases:

- unspecified viral pneumonia; streptococcal pneumonia; pneumococcal pneumonia; pneumonia caused by other bacterial infections;

- pneumonia in mycoses; pneumonia in parasitic diseases; chronic bronchitis; mucopurulent chronic bronchitis; unspecified chronic bronchitis; panlobular emphysema; centrilobular emphysema, chronic obstructive bronchitis; asthma with predominance of allergic component; non-allergic asthma; mixed asthma; unspecified asthma; bronchiectatic disease; coal miner's pneumoconiosis; pneumoconiosis due to silica dust; unspecified pneumoconiosis; hypersensitivity pneumonitis caused by organic dust; farmer's lung; bird fancier's lung; hypersensitivity pneumonitis caused by other organic dust; chronic respiratory conditions caused by the action of chemical substances, gases, fumes, and vapors; unspecified respiratory conditions caused by the action of chemical substances, gases, fumes, and vapors; pneumonitis caused by solid substances and liquids; chronic and other pulmonary manifestations caused by ionizing radiation; chronic drug-induced interstitial lung damage; respiratory conditions caused by unspecified external agents; chronic pulmonary insufficiency after surgical operation DN I-II.

Specialists: pulmonologist, rehabilitologist.

Physical activity: morning hygienic gymnastics, therapeutic exercises with individual sessions if necessary, respiratory (individual) gymnastics, swimming pool exercises, walking in the fresh air, training on a bicycle ergometer, walking.

Internal intake of mineral water in our region: Naftusia at a dose of 3.0–4.0 ml/kg in a warm form (37–40°C) 3 times a day, 1 hour before meals, drink slowly.

Balneotherapy: mineral, carbon dioxide, hydrogen sulfide, coniferous-pearl baths, Charcot's douche, underwater shower massage, rain, circular, hydro-laser showers.

Peloidotherapy: ozokerite therapy – applications on the chest from the front at T 45°C, duration 30 min, for a course of 10–12 procedures, with a break on the 3rd day.

Functional therapy: respiratory gymnastics.

Aerosol therapy: daily inhalations with soda, chamomile, eucalyptus, sage, rosehip oil, for a course of 10–15 procedures, daily.

Massage: general, segmental-reflex, vibrational.

Hardware physiotherapy:

1. General UFO – with the use of protective goggles, duration 5 minutes, gradually increasing the exposure time to 15 minutes, for a course of 10–15 procedures, every other day.

2. Magnetotherapy – procedures on the projection of the pathological focus for 15–20 minutes, for a course of 15–20 procedures.

3. Electrophoresis (calcium chloride, potassium iodide, euphyllin, papaverine) on the chest area 0.08–0.1 mA/cm², procedure duration 10–20 minutes, for a course of 10–12 procedures.

4. Decimeter therapy – on the area of the lung roots daily or every other day, for a course of 10–15 procedures.

5. Amplipulse therapy – paravertebral, frequency 100 Hz, modulation depth 50%, for 3–5 minutes with each type of work, for a course of 10 procedures.

6. Inductothermy – chest area, weak thermal dose for 10 minutes, for a course of 10 procedures.

7. Diadynamic therapy – two-contact wave current, current strength from 2–5 to 15–20 mA, until vibration is felt, 8–10 minutes, for a course of 6–12 procedures.

8. Ultrasound therapy – on the area of the pathological focus for 5–6 minutes, for a course of 10 procedures, every other day.

9. Laser therapy – on the projection of the affected area 1–3 J per cm², daily, for a course of 14–15 procedures.

10. Ultraphonophoresis – with hydrocortisone ointment, on the area of the pathological focus for 3–5 minutes, daily, for a course of 10–15 procedures.

11. Information-wave therapy – on the area of the pathological focus for 10–15 minutes, gap 1–2 cm, daily, for a course of 10–15 procedures.

Contraindications for referring patients with respiratory organ pathology to the rehabilitation department.

- high degree of activity of the process, systemic manifestations, with respiratory failure above stage II; development of amyloidosis; chronic recurrent form of pulmonary artery thromboembolism; chronic lung abscesses in severe exhaustion of patients, accompanied by purulent discharge and hemoptysis; general contraindications for selecting patients for sanatorium-resort treatment: acute infectious and venereal diseases, mental disorders, acute stage of blood diseases, malignant neoplasms, decompensation or exacerbation of cardiovascular diseases.

Questions for self-preparation and initial knowledge control

1. Justify the use of physiobalneotherapy in respiratory organ diseases.

2. What are the main tasks of the rehabilitation department in respiratory organ pathology?

3. What are the functions of the rehabilitation department in respiratory organ pathology?

4. What are the medical indications for referring patients with respiratory organ pathology to the rehabilitation department?

5. What physical factors are used in the hospital rehabilitation stage for patients with lung pathology?

6. Describe the features of prescribing physiobalneotherapy at the sanatorium stage of rehabilitation.

7. What are the contraindications for the use of physiobalneotherapy in respiratory organ diseases?

8. How does physiobalneotherapy affect the course of respiratory organ diseases?

9. What are the main physical factors most commonly used in the stages of rehabilitation for respiratory organ diseases?

10. Under what conditions is physiotherapy contraindicated in respiratory organ diseases?

Task 3. Solving situational problems.

Situational problem 1. Patient A, 35 years old, diagnosed with acute pneumonia, on the third day. Body temperature – 37.8°C. Wet rales are heard below the right scapula, with shortened percussion sound in the same area. Pulse rate is 90 beats per minute. Heart – muffled tones, systolic murmur near the apex.

The following physiotherapeutic treatment is recommended:

- a) electrosleep;
- b) EP UHF;
- c) ozokerite;
- d) ultrasound.
- e) inductothermy;

Task 2. A 50-year-old patient with a diagnosis of COPD is in the day hospital and complains of morning cough with sputum, moderate residual, and aching pain in the chest. What can be recommended for physiotherapy in this case? Provide a clinical-physiological rationale for such a procedure.

Task 3. A 55-year-old patient with a diagnosis of focal pneumonia is in the stationary stage of rehabilitation and complains of severe general weakness, elevated temperature, periodic aching pain in the chest area, and shortness of breath during physical exertion. The patient has been prescribed antibiotic electrophoresis. Provide a clinical-physiological rationale for the prescribed procedure and determine the methodology for prescribing internal organ electrophoresis.

Task 4. A 40-year-old patient with a diagnosis of chronic bronchitis is in the stationary stage of rehabilitation and complains of constant cough, slight shortness of breath during physical exertion, and frequent headaches. The patient has been prescribed laser therapy. Provide a clinical-physiological rationale for the prescription of the procedure and describe its therapeutic effects.

Task 5. A 38-year-old patient with a diagnosis of bronchial asthma is undergoing sanatorium-resort rehabilitation. There are no complaints. The patient has been prescribed speleotherapy. Provide a clinical-physiological rationale for the prescribed procedure and describe its methodology.

Task 6. A 50-year-old patient with a history of viral pneumonia is undergoing sanatorium-resort rehabilitation. There are no complaints. What type of balneotherapy can be recommended in the first place?

- a) underwater shower massage;
- b) coniferous-pearl bath;
- c) oxygen bath.

Task 7. A 47-year-old patient with a diagnosis of bronchial asthma and osteochondrosis of the thoracic and lumbar spine is undergoing sanatorium-resort rehabilitation. Underwater shower massage has been prescribed. Justify the prescription of the procedure and its methodology.

Task 4. Completion of test tasks for final control.

1. What type of current is used for medicinal electrophoresis in respiratory organ diseases:

- a) galvanic;
- b) low-frequency pulsed currents;
- c) high-frequency alternating pulsed current with high voltage and low intensity;
- g) pulsed sinusoidal modulated current of low intensity.

2. What concentration of medicinal substances is advisable to use during medicinal electrophoresis:

- a) 2 – 5%;
- b) 10 – 15%.

3. Are these physical factors compatible with medicinal electrophoresis in one day:

- a) inductothermy;
- b) ultrasound;
- c) darsonvalization;

- d) local electric light lamp;
- e) high-pressure shower;
- f) hydrogen sulfide and radon baths.

4. Indicate which physical and balneological factors can be prescribed before and after the procedure of medicinal electrophoresis:

- a) UHF therapy;
- b) fresh, coniferous, sea baths;
- c) microwave therapy;
- d) low-pressure shower.
- e) mud, ozokerite, paraffin;

5. What type of current is used in the electrosleep method:

- a) direct current;
- b) sinusoidal current;
- c) pulsed current with rectangular pulse shape;
- d) pulsed current with semi-sinusoidal pulse shape.

6. The main therapeutic effects of electrosleep:

- a) sedative;
- b) ganglioblocking;
- c) trophic;
- d) resorptive;
- e) analgesic;
- f) anti-inflammatory.
- g) vasodilating;

7. Which of the listed diseases are indications for electrosleep treatment:

- a) stage IIA hypertension;
- b) bronchial asthma;
- c) IHD with impaired heart rhythm and conduction.

8. What type of current is used in the diadynamic therapy method:

- a) direct current;
- b) high-frequency and low-intensity pulsed current;
- c) low-frequency pulsed current;
- d) medium-frequency pulsed current.

9. What type of current is used in the amplipulse therapy method:

- a) direct current;
- b) low-frequency pulsed current;
- c) high-frequency and low-intensity pulsed current;
- d) pulsed current with a frequency of 5000 Hz, modulated by low-frequency oscillations.

10. By means of what type of devices are actions carried out in the method of UHF therapy:

- a) electrode;
- b) inductor-cable;
- c) radiator;
- d) reflector.
- e) capacitor plates;

11. What reactions occur in tissues under the influence of IR radiation:

- a) molecular displacements;
- b) increase in temperature of the irradiated area;
- c) acceleration of physicochemical processes;
- d) vitamin formation;
- e) reflex effects on internal organs;
- f) photoisomerization.

12. Depth of penetration of UV radiation into tissues:

- a) up to 2–6 cm;
- b) up to 1 cm;
- c) up to 1 mm.

Answers to questions

For situational problems: 1. b); 2) electrophoresis of 10% calcium chloride; 3) in the physiotherapy department, electrophoresis was performed in parallel with intravenous administration of antibiotics; 6) e)

For test questions: 1) a; 2) b; 3) a, b, c; 4) a, b, c; 5) c; 6) a, c; 7) a; 8) c; 9) c; 10) c; 11) a, b, c, d; 12) c.

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GUIDELINES FOR PRACTICAL LESSON № 4

Physiobalneotherapy in the rehabilitation of patients with chronic bronchitis and pneumonia

Lesson objective: Clinical-physiological justification for the use of physiobalneotherapy in chronic bronchitis and pneumonia; study of the mechanism of physiological and therapeutic effects of physical therapeutic factors and tasks of physiobalneotherapy in chronic bronchitis and pneumonia; mastering the techniques of using therapeutic physical factors in chronic bronchitis and pneumonia.

Main stages of the session

- I. Assessment of the initial level of knowledge (oral questioning).
- II. Discussion of the self-studied educational material.
- III. Performing tasks and solving situational problems.

Theoretical information

Pathology of the respiratory system in connection with air pollution, population sensitization, and the COVID-19 pandemic has become a serious challenge for the healthcare system in the 21st century. Very often, after viral infection or under the influence of other harmful agents, chronic obstructive lung diseases develop. The functional state of the respiratory system plays a significant role in the development of this pathology [3, 5].

Goals of physiobalneotherapy in pneumonia:

- reduction of inflammatory processes;
- improvement of blood and lymph circulation in lung tissue to accelerate the resorption of inflammatory infiltrate.
- Improvement of bronchial patency and elimination of sputum.

Task 1. Master the main indicators of questionnaires, pulse oximetry, and spirometry for prescribing physiotherapeutic factors in chronic bronchitis and pneumonia at the hospital and sanatorium stages of rehabilitation [3].

Several validated questionnaires exist for assessing the severity of symptoms in patients with chronic lung diseases [3]. GOLD recommends using the modified Medical Research Council (mMRC) questionnaire or the Chronic Obstructive Pulmonary Disease Assessment Test (CAT). The popular mMRC questionnaire allows for the assessment of only physical activity impairment related to dyspnea, while the CAT has a broader scope, allowing for the evaluation of the impact of chronic obstructive pulmonary disease (COPD) on daily life and patient health. Normal pulse oximetry readings range from 96% to 98%. The diagnosis of COPD should be suspected in all patients with dyspnea, chronic cough, or sputum production, and/or with risk factors for this disease in their medical history. Confirmation of the syndrome is achieved through spirometric examination of the external respiratory function [3]. When evaluating the spirometry results of an expiratory maneuver, the following are calculated: 1. Forced expiratory volume in one second (FEV1) – the amount of air expelled from the lungs during the first second of forced expiration. 2. Tiffeneau index (FEV1/FVC, %) – the ratio of FEV1 to forced vital capacity (FVC). Normal spirometry values are >0.70 . An FEV1/FVC ratio <0.70 confirms the presence of persistent airflow limitation and, therefore, COPD.

Task 2. Master the algorithm for prescribing physiotherapeutic factors in bronchitis and pneumonia during the hospital and outpatient stages of rehabilitation.

Hospital rehabilitation period

Ultraviolet irradiation of the chest. It is performed with five fields: the first and second fields cover half of the posterior surface of the chest (right or left, upper or lower). The third and fourth fields cover the lateral surfaces of the chest. The fifth field covers the anterior surface of the right chest. The radiation dose ranges from three to five biologically effective doses; one field is irradiated per day, and each field is irradiated 2–3 times daily.

Electric field of UHF on the chest. The technique can be transverse or longitudinal. The power of the electric field is 50 W, with a

duration of 5–10 minutes daily, for a course of 5 procedures. Under the influence of the procedure, blood and lymph circulation in the lungs increase, leading to enhanced phagocytic activity of leukocytes and reduction of inflammatory foci.

Diathermy therapy on the interscapular region. The emitter is placed with a gap of 5 cm, with a power of 20–30 W, and a procedure duration of 10–15 minutes daily, for a course of 10–12 procedures. The procedure results in an increase in the temperature of lung tissue and improvement of blood and lymph circulation, leading to the resorption of inflammatory infiltrate in the lungs and improvement of external respiration function.

Ultrasound on the chest area. It is performed in a lying position. The surface of the chest is divided into 6 fields: right and left anterior surface of the chest, right and left posterior fields of the chest, and two lateral fields. Two fields, excluding the area of the heart and sternum, are treated each day. The mode is continuous, with a mobile technique, a dose of 0.2–0.4 W/cm², for 3 minutes on each field, daily or every other day, for a course of 6–8 procedures. The ultrasound is applied segmentally-paravertebrally and above the lesion focus along the intercostal spaces, using a labile technique, for 10–12 minutes on each area. Under the influence of ultrasound, bronchial and alveolar spasms are relieved, and exudate is resorbed, preventing the formation of pleural adhesions.

Electrophoresis of antibiotics. Internal organ electrophoresis can be performed when the patient has a high temperature, with the drugs being administered intravenously in the physiotherapy department or injected intramuscularly 20 minutes before the electrophoresis procedure. It acts on the projection area of pneumonia, with a current strength of 3–5 mA, for a course duration of 6–8 procedures, daily.

Ultrasonic inhalations of antibiotics. Antibiotics are used based on the sensitivity of the microflora in the bronchial secretions. For one inhalation, antibiotics are dissolved in 10–20 ml of distilled water, and 2–3 inhalations are performed throughout the day, for a treatment course of 6–8 days.

Laser irradiation of blood. Optical irradiation in the infrared range is used to affect the projection area of the elbow vein. The technique is stable, with an irradiation pulse power of 4–10 W, a frequency of 50 Hz, and a procedure duration of 8–12 minutes, daily or every other day, for a treatment course of 8–12 procedures. Under the influence of laser irradiation, there is an enhancement of the bactericidal activity of blood serum, an increase in immunoglobulins and oxygen capacity of the blood, an increase in the level of free heparin in the blood serum, leading to inhibition of thrombus formation.

Ambulatory rehabilitation period

Prolonged aerotherapy. This refers to prolonged exposure to fresh air, including sleep, under a mild or moderate aerotherapy regimen.

Air baths – controlled exposure to fresh air on the fully or partially exposed patient. Depending on the season and weather, baths are taken in rooms with open windows, verandas, balconies, or in special climate pavilions or tents by the seaside. The dosage of air baths is conducted according to specific cold load regimens (difference between heat dissipation and heat production, relative to body surface area). The duration of procedures ranges from 10 minutes to 1.5 hours, with a treatment course consisting of 10–20 procedures.

Haloaerosol therapy. This is performed in halo chambers designed for 4–8 patients simultaneously, where the therapeutic factor is the inhalation of dry aerosol of sodium chloride, which is dispersed using a halogenerator. Depending on the degree of bronchial patency, four modes of haloaerosol therapy are used with aerosol concentrations of 0.5–1, 1–3, 3–5, 7–9 mg/m³, respectively. Inhalations are carried out through a mask, with a procedure duration of 15 minutes, daily, for a treatment course of 12–14 procedures. When the aerosol reaches the distal parts of the bronchial tree, there is a reduction in the inflammatory process and activation of bronchial drainage function, leading to an increase in the amount of expectoration.

Carbon dioxide baths. The concentration of carbon dioxide gas in the baths is 1.2–1.4 g/L. The water temperature in the bath at the

beginning of rehabilitation is 36°C, and gradually decreases to 30°C during the rehabilitation process. The procedure duration is 20–25 minutes, with a treatment course consisting of 10–15 baths. Under the influence of the baths, there is an improvement in pulmonary hemodynamics, an increase in minute ventilation, and normalization of bronchial tone.

Sanatorium-resort treatment of conditions after pneumonia

The main tasks of the sanatorium rehabilitation department for respiratory organ pathology

1. Implementation of highly qualified restorative treatment for patients with respiratory organ pathology according to individual rehabilitation programs in accordance with current standards, clinical protocols of sanatorium-resort rehabilitation with the aim of:

- elimination or reduction of inflammation of the respiratory organs;
- restoration or improvement of impaired respiratory organ functions;
- normalization of adaptive-compensatory mechanisms and increase in overall reactivity of the body.
- increase in the level of performance, physical and mental activity of patients and their preservation.

2. Adherence to the basic principles of rational use of therapeutic physical factors:

- correctness, completeness, and clear formulation of the diagnosis with mandatory indication of the clinical form of the disease, its stage, the presence and nature of complications;
- the use of physical resort factors should be consistent at all stages of rehabilitation measures;
- the use of physical resort factors should be etiologically and pathogenetically justified;
- the choice of physiotherapy and resort treatment methods, as well as the techniques of procedures, should be strictly differentiated, taking into account the characteristics of the nature, main clinical manifestations or traumatic injuries, individual characteristics of

the state of reparative processes and the plan of the disease, the initial functional state of the patients;

- systematic medical control over the state of reparative processes, appropriate reactions of the patients' body, based on data from both immediate and remote consequences of the use of physical and resort factors;
- correct clinical interpretation of the detected reactions for timely correction of therapeutic measures.

3. Dynamic control over the process of medical rehabilitation:

- study of both immediate and remote results of rehabilitation of patients who underwent rehabilitation in a sanatorium, study of the effectiveness of medical rehabilitation measures according to effectiveness criteria.

4. Timely provision of emergency and urgent care to patients with the implementation (if necessary) of transportation to appropriate specialized stationary facilities.

Stage objectives: if necessary, continuation of anti-inflammatory therapy, restoration of the drainage function of the bronchopulmonary system; correction of changes that occurred as a result of previous antibiotic therapy (dysbiosis, decreased functional activity of the digestive organs), detoxification of the body; enhancement of general and local reactivity of the body; normalization of physical and emotional potential of the patient; correction of concomitant pathology.

Diet: should be easily digestible, well-cooked, vitaminized, containing animal protein, dairy products, 30–40% plant-based fat, fruits.

Sanatorium regime: II–III

Climatotherapy: climate of coastal areas, mountains, forests.

Exercise regime: morning hygienic gymnastics, therapeutic exercises, breathing exercises, sound gymnastics, swimming pool sessions, controlled walking and running, training on a stationary bicycle, walking, terrain training, controlled skiing, circular training, postural drainage and drainage exercises, classical and segmental massage, self-massage, acupuncture massage.

Hardware physiotherapy. Positional aerosol therapy (reparative):

a) extracts of therapeutic peloids (peloidin, humizol, aloe juice or kalanhoe juice 1.0 ml + 3.0 ml of soda solution; plantain juice 1 ml + 3 ml of 0.5% soda solution; lysozyme 100 ml in 20 ml of physiological solution, 5% solution of ascorbic acid, vitamin mixtures.

b) broncholytic: magnesium sulfate (1 ml of 25% solution + 3.0 ml of water), inhalations of 0.5–1% solution of euphyllin more often in the form of iodinated mixture, cholinolytics (atropine) 2–4 ml for inhalation;

In case of prolonged course of pneumonia, in cases of persistent rales and cough: phonophoresis of hydrocortisone on the chest over the focus projection (1 ampoule is dissolved in 0.2% solution of sodium bicarbonate), 8–10 procedures per course.

Electrophoresis: trypsin, chymotrypsin, mucosolvin, iodine, copper, calcium, aloe.

SMX-therapy, from the apparatus "SMV 150-1", "Luch-11", "Luch-3", "Radarmed".

DWT therapy: from the "Romashka", "Ranet", "Terma" apparatus, 9–12 W, 10 minutes, No. 10

Peloid and ozokerite therapy.

Applicative peloid therapy: T° 38–40°C (peat), 38–40°C (muddy), procedure duration 15–20 minutes, 10 procedures per course, performed every other day.

Duration of sanatorium-resort treatment: 21–24 days.

Quality indicators of treatment: clinical and laboratory signs of remission of the inflammatory process in the lungs, significant reduction or absence of sputum production and ventilation disorders in the lungs, disappearance of radiological signs of inflammation in the lungs.

Contraindications: pneumonia in the acute stage, pneumosclerosis and pneumoconiosis accompanied by pulmonary heart failure above stage II; bronchiectasis, chronic lung abscesses with severe exhaustion of patients accompanied by purulent sputum production and hemoptysis.

Questions for self-preparation and initial knowledge assessment

1. Justify the use of physiobalneotherapy in respiratory organ diseases.

2. What are the objectives of physiotherapy in the rehabilitation of patients with chronic bronchitis?
3. What is the mechanism of action of physical factors in chronic bronchitis?
4. What physical factors are used in the rehabilitation of patients with chronic bronchitis?
5. Describe the peculiarities of prescribing physiotherapy for different forms of chronic bronchitis.
6. What are the contraindications for the use of physiotherapy in chronic bronchitis?
7. What are the objectives of physiotherapy in the rehabilitation of patients with pneumonia?
7. At what terms are physical factors prescribed for pneumonia?
8. What is the mechanism of action of physical factors in pneumonia?
9. How does physiotherapy affect the course of pneumonia?
10. What physical factors are used in the rehabilitation stages of pneumonia?
11. Under what conditions is physiotherapy contraindicated in pneumonia?

Task 2.

Master the algorithm for prescribing physiotherapeutic factors in chronic bronchitis and pneumonia at the sanatorium-resort stage of rehabilitation.

Task 3. Solving situational problems.

Task 1. A 53-year-old patient diagnosed with pneumonia in the resolution stage. Ultraviolet irradiation of the chest is prescribed. Provide a clinical-physiological rationale for the procedure and describe its methodology.

Task 2. A 46-year-old patient diagnosed with pneumonia. Ultrasound is prescribed for the chest area. Provide a clinical-physiological rationale for the procedure and describe its methodology.

Task 3. A 39-year-old patient diagnosed with pneumonia. Complaints of cough with sputum production and fever. Ultrasonic inhalation with surfactants is prescribed. What medications can be used? Provide a clinical-physiological rationale for the procedure and describe its methodology.

Task 4. A 55-year-old patient diagnosed with pneumonia. Laser irradiation of the blood is prescribed. Provide a clinical-physiological rationale for the procedure and describe its methodology.

Task 5. A 33-year-old patient diagnosed with acute exacerbation of chronic bronchitis. Complaints of cough with purulent sputum production. Internal organ electrophoresis of an antibiotic, determined by the sensitivity of the microflora in sputum bacterial analysis, is prescribed. Provide a rationale for the procedure and describe its methodology.

Task 6. A 59-year-old patient diagnosed with obstructive chronic bronchitis. Complaints of dyspnea and cough with sputum production. Speleotherapy is prescribed. Provide a clinical-physiological rationale for the procedure and describe its methodology.

Task 7. A 65-year-old patient diagnosed with purulent-obstructive chronic bronchitis. Complaints of cough with purulent sputum production during exacerbation, moderately reduced respiratory system functional parameters. Inhalation therapy is prescribed. Which aerosols can be used?

Task 8. A 42-year-old patient diagnosed with pneumonia in the resolution stage. Ultraviolet irradiation of the chest is prescribed. Justify the prescription of the procedure and describe its methodology.

Task 9. A 48-year-old patient diagnosed with chronic pneumonia in remission, came for sanatorium-resort rehabilitation treatment. Ultrasound is prescribed for the chest area. Explain the appropriateness of the procedure and describe its methodology.

Task 4. Performing test tasks for final assessment control.

1. In the acute phase of focal pneumonia during the period of bacterial aggression (1–3 days of illness) with cough and sputum

production, elevated body temperature up to 38°C, indicate the most optimal method of treatment:

- a) internal organ electrophoresis of antibiotics;
- b) electrophoresis of antibiotics using the transverse technique;
- c) electrophoresis of antibiotics using the longitudinal technique;
- d) thermal inhalations of antibiotics.

2. In the acute stage of focal pneumonia during the period of clinical stabilization of the process (3–10 days of illness), the optimal combination of physical methods is:

- a) UHF and UFO electric field in erythema dose;
- b) high-frequency magnetotherapy and mucolytic inhalations;
- c) UHF electric field and mucolytic inhalations;
- d) microwave therapy and oxygen barotherapy.

3. In acute pneumonia complicated by abscess formation without drainage of the purulent cavity, the following should be prescribed:

- a) laser irradiation of blood;
- b) UHF electric field;
- c) UFO in erythema dose;
- d) electrophoresis of antibiotics;
- e) antibiotic inhalations.

4. What procedures should be prescribed for a patient with acute pneumonia complicated by abscess formation, during abscess drainage:

- a) electrophoresis of antibiotics;
- b) UHF electric field in thermal doses;
- c) microwave therapy;
- d) UHF electric field in non-thermal doses;
- e) ultrasound therapy.

5. Choose the most effective combination of physical treatment methods for a patient with acute pneumonia, pneumosclerosis, stage I fibrosis during the morphological recovery phase (10–20 days of illness), with the presence of inflammatory infiltrate in the lungs, with a mild cough and a small amount of sputum:

- a) low-intensity UHF therapy (in non-thermal doses);

- b) high-frequency magnetotherapy on the infiltrate area and mucolytic inhalations;
- c) UHF electric field in subthermal doses and mud applications;
- d) low-frequency magnetotherapy and alkaline inhalations;
- e) UHF electric field in thermal doses and mucolytic inhalations.

6. For inhalation therapy of patients with chronic bronchial diseases, aerosols are used:

- a) fine droplets;
- b) large droplets;
- c) low-dispersion;
- d) high and medium dispersion.

7. Ultrasound therapy is contraindicated in:

- a) pneumonia during the morphological recovery stage (10–20th day of the disease);
- b) pneumosclerosis;
- c) bronchiectatic disease;
- d) exacerbation of chronic bronchitis in the subacute period with stage II respiratory failure;
- e) moderate-severe exacerbation of bronchial asthma, stage I respiratory failure.

8. Indicate the optimal method of treatment for a patient with chronic bronchitis and pneumosclerosis in the remission phase at a resort:

- a) inhalation of sea water;
- b) halotherapy;
- c) inhalation of mucolytics;
- d) mud applications on the chest;
- e) UHF electric field in a thermal dose.

Correct answers to the tests

1	2	3	4	5	6	7	8
a	b	a	d	d	d	c	d

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GUIDELINES FOR PRACTICAL LESSON № 5

Physiobalneotherapy in the rehabilitation of patients with bronchial asthma

Lesson objective: Clinical-physiological justification for the use of physiobalneotherapy in bronchial asthma; study of the mechanism of physiological and therapeutic effects of physical therapeutic factors and tasks of physiobalneotherapy in bronchial asthma; mastering the techniques of using therapeutic physical factors in bronchial asthma.

Main stages of the session

- I. Control of the initial level of knowledge (oral questioning).
- II. Discussion of the independently studied educational material.
- III. Performing tasks and solving situational problems.

Theoretical information

Bronchial asthma is a chronic disease characterized by attacks of dyspnea, which occur due to spasm of small and medium bronchi, leading to an increase in residual lung volume, a decrease in their elasticity, and pulmonary and cardiac insufficiency.

Bronchial asthma is divided into infectious-allergic form and non-allergic-infectious (atopic) form.

Objectives of physiotherapy:

- reduction of inflammation of the bronchial mucosa;
- elimination of bronchospasm;
- normalization of the tone of the central nervous system and elimination of pathological cortico-visceral reflexes;
- reduction of the tone of the respiratory muscles, thinning and facilitation of sputum discharge;
- reduction of bronchial tree sensitivity to allergies.

Hospital stage of rehabilitation

Electrosonotherapy. The electrodes are placed either on the forehead and occiput or on the forehead and temples. A rectangular

pulse current with a frequency of 1–15 Hz is used, with a duration of 0.4–2 ms and a current strength of 5–8 mA. The procedure lasts for 20–40 minutes daily, with a total of 15–20 treatment sessions.

Aerosol inhalation of glucocorticoids. Individual metered-dose inhalers are used. Glucocorticoids (such as flunisolide and budesonide) reduce the sensitivity of the bronchial mucosa to allergens, promote the restoration of the damaged bronchial epithelium, decrease the permeability of the capillaries in the bronchial mucosa, and prevent the development of sclerotic changes in the bronchial walls.

Ultrasonic aerosol inhalation. Solutions of atropine, theophylline, and albuterol are used. The inhalation lasts for 10 minutes daily, with a total of 10–12 treatment sessions.

Ultrasonic aerosol inhalation of mucolytics. Trypsin and chymotrypsin are used. The inhalation lasts for 3–5 minutes daily, with a total of 10–15 treatment sessions.

DMBT therapy for the adrenal glands. The emitter is placed on the projection area of the adrenal glands at the level of ThX–LIII with a 5 cm gap. The power of radiation is 30–40 W, and the exposure time is 10–12 minutes daily, with a total of 10–12 treatment sessions.

Inductothermy of the adrenal glands. The inductor disk or inductor cable is placed on the back with a 1–1.5 cm gap at the level of ThX–LIII. The procedure lasts for 10–12 minutes daily, with a total of 10–12 treatment sessions.

Electrophoresis of calcium chloride solution according to S.B. Vermel. One electrode soaked in a 2–5% calcium chloride solution is placed on the interscapular area, while the other two electrodes are placed on the posterior surface of the shins. The current strength is 10–20 mA, and the procedure lasts for 20 minutes daily, with a total of 10 treatment sessions.

Medicinal electrophoresis. Antibiotics, 2–5% calcium chloride solution, 2–5% potassium iodide solution, and 2–5% theophylline solution are used. The procedure is performed using the transverse or longitudinal method, or the general method (according to S.B. Vermel). The current strength is 10–15 mA, and the current density is 0.03–

0.5 mA/cm² for 15–20 minutes daily, with a total of 10–12 treatment sessions.

Infrared laser therapy. Infrared laser radiation with a wavelength ranging from 0.89 to 1.2 μm is used in continuous mode with a power of 40–60 mW and a frequency of 80 Hz. The irradiation is performed on the following areas: the middle of the chest, the interscapular region, paravertebral area, and the area of the inflammatory focus projection. Each area is irradiated for 1–2 minutes, and the duration of the procedure is 12–15 minutes. This therapy is administered daily for a course of 10 procedures.

Breathing exercises (BE), used either independently or as part of respiratory gymnastics (RG) complexes, are a widely accessible method for normalizing, restoring, or activating the basic functions of external respiration. The filling and emptying time of the lungs as a whole, as well as individual lung segments, depend on the aforementioned lung elasticity and bronchial resistance [12]. The greater these values, the longer the filling and emptying time of the individual lung zones. The segments that are first to fill during inhalation receive gas from the dead space, and gas transfer occurs between different zones.

As previously mentioned, the main respiratory muscle is the diaphragm, which is a flat dome-shaped muscle that separates the chest and abdominal cavities. When the diaphragm contracts, it enlarges, increasing the volume of the chest cavity and creating slight pressure on the organs located in the abdominal cavity.

Diaphragmatic breathing (DB) forms the basis of most respiratory exercises aimed at improving lung function, as it primarily contributes to the coordinated functioning of the entire respiratory system .

Breathing exercises can also be performed in a lying position (it is recommended to perform these exercises during inpatient and outpatient treatment).

First exercise. Lying on the back, arms along the body. Inhalation is done through the nose and is performed simultaneously with the bending of one leg, without tensioning the abdominal muscles, by sliding

the heel along the surface (this prevents an increase in intra-abdominal pressure, which limits diaphragmatic movement). Exhalation (through the mouth) is done slowly with repeated sliding of the heel along the surface of the bed (providing gravitational unloading). After returning to the starting position, the exercise is repeated on the opposite side.

Exercise 2. Supine position, arms bent at the elbows, support on the back surface of the shoulders. While inhaling through the nose, simultaneously lift the chest (using the elbows as support). On exhaling (through the mouth), straighten the arm, stretching diagonally in the opposite direction. Return to the starting position. Repeat the exercise on the opposite side.

Exercise 3. Supine position, hands bent at the elbows, palms under the head, arms bent in front of the body.

Abduct the elbows to the side – inhale (through the nose). On exhaling (through the mouth), lift the elbows upwards, slightly flexing the spine, and press the hands against the chest, increasing the elastic compression of the chest.

The effect of deep breathing exercises in patients with chronic obstructive pulmonary disease (COPD) is as follows:

- The maximum necessary lung volume is engaged, improving natural ventilation, which promotes lung cleansing and increases their capacity (approximately 10–30%).
- Deep breathing exercises contribute to maximum oxygen saturation of the blood (due to effective ventilation-perfusion ratio in the lower parts of the lungs) with minimal energy expenditure.
- The diaphragm, during movement, massages the liver and other internal organs, improving peripheral blood circulation and vascular tone (including in the portal vein basin), promoting digestion activation and improving the functions of the gastrointestinal tract and adrenal glands.
- Deep breathing exercises help relieve muscle tension and restore mobility in the lower back, pelvic, and abdominal regions,

especially in patients who have been in a lying or sitting position for a long time.

- Deep breathing exercises have a positive effect on the psychoemotional state [5].

Outpatient treatment

Inductothermy on the lung roots. The inductor disk or inductor cable is placed on the interscapular area with a gap of 1–1.5 cm. The procedure lasts for 15 minutes daily, for a course of 10 procedures.

DWT therapy. It is performed on the lung root area. The emitter is placed with a gap of 30–50 W, and the procedure lasts for 10–12 minutes.

Haloaerosol therapy. It is carried out in halo chambers, which are designed for 4–8 patients simultaneously, where the active therapeutic factor is the inhalation of dry aerosol of sodium chloride, which is sprayed using a halogen generator. Depending on the degree of bronchial patency, four modes of halo therapy are used with aerosol concentrations of 0.5–1, 1–3, 3–5, 7–9 mg/m³. Inhalations are performed through a mask, the duration of the procedure is 15 minutes, daily, for a course of treatment of 12–14 procedures. When the aerosol reaches the distal parts of the bronchial tree, there is a reduction in the inflammatory process and activation of the bronchial drainage function, as well as an increase in the amount of expectoration.

Speleotherapy. Therapeutic stay of patients in the microclimate conditions of natural caves. The active factors of the caves are fine-dispersed aerosols of sodium, calcium, potassium, and magnesium salts, as well as negative air ions. The duration of the procedures is 1–5 hours during the day and 12 hours at night, with a course of treatment of 18–20 procedures. A repeated course of speleotherapy is conducted after 1 year. Inhalation of aerosols and air ions leads to thinning of sputum and acceleration of its elimination, restoration of the secretory state of the ciliated epithelium of the bronchi and blood circulation of the mucous membrane of the respiratory tract. The low number of microorganisms in the cave air leads to a decrease in sensitization of the body, balances

the processes of excitation and inhibition in the cerebral cortex, resulting in a feeling of psychoemotional comfort.

Adrenaline electrophoresis on the interscapular area. One electrode with a pad soaked in a 0.1% adrenaline solution is placed on the interscapular area, and the other is placed on the front right side of the chest, with a current strength of 4–6 mA, for 10–20 minutes, daily or every other day, for a course of treatment of 10 procedures.

Endonasal calcium electrophoresis. Moistened gauze tampons soaked in a CaCl solution are inserted into the nasal passages, the ends of which are placed on a cloth located on the upper lip and covered with electrode pads measuring 1×2 cm, which are secured with a bandage. The second electrode is placed on the occiput. The current strength is 1–2 mA. The duration of the session is 10–20 minutes, daily or every other day.

Hyperbaric oxygen therapy. Therapeutic use of oxygen under increased atmospheric pressure. The procedure is performed in hyperbaric chambers, with a course of treatment of 10–15 procedures. Oxygen under increased pressure stimulates the processes of lung tissue regeneration, promotes relaxation of the smooth muscles of the bronchi, and facilitates expectoration.

Transcutaneous laser irradiation of blood (TLIB). This is the application of optical irradiation in the infrared range to the projection area of the elbow vein. The technique is stable, with an impulse power of 4–10 W, a frequency of 50 Hz, and a duration of 8–12 minutes. It is performed daily or every other day, for a total of 8–12 treatment sessions.

Sanatorium and resort treatment of bronchial asthma.

Objectives of this stage: 1) improvement of bronchial drainage function; 2) correction of respiratory insufficiency; 3) desensitization; 4) enhancement of general and local reactivity of the body; 5) normalization of physical and emotional potential of the patient; 6) correction of concomitant pathology.

The diet should be balanced, excluding allergenic foods, and sufficiently vitaminized. Table No. 15 or 5 (in the presence of concomitant diseases) should be followed.

Sanatorium regime: I–III.

Climatotherapy: dry climate of coastal areas, mountains.

Exercise regimen: morning hygienic gymnastics, therapeutic physical exercises (LFC), walking tours, bathing. Walking tours should cover a distance of 1500 m with an incline of 5–10°C. If there is no shortness of breath, the distance can be increased to 3000 m with an incline of 6–12°C.

Aerotherapy at a temperature not lower than 10°C. Sun baths with a mild regimen. Sea baths with water temperature of 23–25°C with a moderate regimen.

Aero-phytotherapy. Essential oils such as mint, lavender, sage, fennel, pine, eucalyptus, etc. are recommended. The procedure should last 15–20 minutes, with a total of 15 sessions.

Aerosol therapy: using bronchodilator herbs, mineral waters, and, if necessary, mucolytic agents. The procedure should last 7–10 minutes, with a temperature of 33–35°C, for a total of 15 sessions.

Speleotherapy, artificial "salt climate" with a concentration of sodium chloride of 12–16 mcg/m³. The procedure should last 30–60 minutes, with a total of 15–25 sessions.

Massage, vibrational massage.

Hardware physiotherapy: to optimize the acclimatization period in patients with chronic non-specific lung diseases (CNSLD) predisposed to autonomic-vascular disorders, psychoemotional disturbances, and bronchospasm during the sanatorium-resort stage, magnetopuncture is used. For this purpose, the zone segmentally innervated by the lungs and sympathetic nervous system, located on the skin surface of the back at the level of D1-2, 1.5 cm away from the spinous processes of the spine, is selected. Magnetic leaf applicators (ALM-1) with a maximum magnetic induction of 8.2 mT are applied to these zones on both sides, with an exposure time of 3 hours daily for 10–12 days.

Inductothermy is applied to the area above the kidneys, with a low thermal dose. The procedure lasts for 10 minutes, with a course of 10 procedures.

Electrophoresis of medicinal substances (5% magnesium sulfate, 2% sodium bromide, 5% calcium chloride, 2% potassium iodide, etc.) is performed. The electrodes are placed transversely in the chest area or longitudinally according to Vermel's technique, as well as endonasally. The current density is 0.08–0.1 mA/cm², and the procedure lasts for 10–15–20 minutes, with a course of 10–12 procedures.

Ultrasound is applied to reflexogenic zones, as well as the chest area, with a course of 10–15 procedures, every other day.

Electrosonotherapy is performed using the occipital-temporal technique, with a frequency of 10–40 Hz (depending on the initial vegetative tone: 30–40 Hz for vagotonia, 5–10 Hz for sympathicotonia), and a duration of 20–40 minutes. The course consists of 10–12 procedures.

Peloidotherapy. Mud applications are applied paravertebrally, covering the cervical-thoracic ganglion and the area above the adrenal glands, at a mud temperature of 38–42°C, every other day, for 10–15 minutes. The course consists of 10–12 procedures.

Ozokerite and paraffin therapy. Applications are applied to the anterior chest area, with a temperature of 42–45°C, for 10 minutes, with a course of 10 procedures.

Normobaric hypoxia therapy. The therapeutic hypoxic mixture used contains 10–12% oxygen and 88–90% nitrogen. It is administered under a pressure of 1020 hPa. The temperature of the mixture is 18–23°C, and the volumetric flow rate is 0.72 m³/h.

Balneotherapy.

Carbon dioxide baths improve bronchial patency. The concentration of CO₂ in artificial baths does not exceed 1.2–1.4 g·l⁻¹. When using mineral water, the carbon dioxide content should be at least 0.75 g·l⁻¹. The temperature gradually decreases during the course of treatment from 32°C to 30°C. "Dry" carbon dioxide baths are also used: the patient's body is exposed to a saturated mixture of atmospheric air and carbon dioxide at a temperature of 25–26°C.

Iodobromine, artificial oxygen, and nitrogen baths, with a water temperature of 37–36°C, for a duration of 10 minutes, for 10–12 procedures every other day.

Chloride-sodium baths. Water temperature of 37–36°C, for a duration of 10 minutes, for 10–12 procedures every other day.

Additionally: laser therapy, reflexotherapy, etc.

The duration of sanatorium-resort treatment is 21–24 days.

Quality indicators of treatment: absence or reduction of complaints, clinical and laboratory signs of remission, disappearance or reduction of coughing attacks, dyspnea, frequency and dosage of bronchodilator use, improvement or normalization of external respiratory function.

Contraindication: acute exacerbation of bronchial asthma.

Task 1. Master the algorithm for prescribing physiotherapeutic factors for bronchial asthma during the hospital, outpatient, and sanatorium stages of rehabilitation.

Task 2. Solve situational problems.

Problem 1. A 44-year-old patient with a diagnosis of moderate bronchial asthma. Adrenal cortex hormone therapy is prescribed. Provide a clinical-physiological justification for the procedure and describe its methodology.

Problem 2. A 47-year-old patient with a diagnosis of mild bronchial asthma. Inhalation therapy with haloaerosol is prescribed. Provide a clinical-physiological justification for the procedure and describe its methodology.

Problem 3. A 28-year-old patient with a diagnosis of moderate bronchial asthma. Complaints of dyspnea and wheezing attacks. Speleotherapy is recommended. Provide a clinical-physiological justification for the procedure and describe its methodology.

Questions for self-preparation and initial knowledge assessment

1. What are the objectives of physiobalneotherapy in the rehabilitation of patients with bronchial asthma?
2. Name the indications and contraindications for the use of physiobalneotherapy at the outpatient stage of rehabilitation for patients with bronchial asthma.

3. Name the indications and contraindications for the use of physiotherapy in the sanatorium-resort stage of rehabilitation for patients with bronchial asthma.
4. What is the mechanism of action of physical factors in bronchial asthma?
5. What is the main mechanism of therapeutic effect of speleotherapy in bronchial asthma?
6. What physical factors are used in the rehabilitation stages of bronchial asthma?

Task 4. Completion of test tasks for final assessment.

1. During exacerbation of atopic bronchial asthma, the following physiotherapy method should be considered as pathogenetic:

- a) endonasal electrophoresis of intal;
- b) aerionotherapy;
- c) galvanization of the chest using the transverse technique;
- d) amplipulsetherapy paravertebrally.

2. To relieve an asthma attack in a patient with mild disease, the following are used:

- a) UHF electric field on the lung root;
- b) DMSO therapy on the adrenal glands;
- c) UHF electric field (transcerebral);
- d) endonasal electrophoresis of novocaine and adrenaline.

3. In bronchial asthma with a dysgormonal course and adrenal insufficiency, the following pathogenetic treatment method is used:

- a) ultrasound therapy paravertebrally in the thoracic region;
- b) high-frequency magnetotherapy on the adrenal glands;
- c) halotherapy;
- d) high-frequency magnetotherapy on the pituitary gland;
- e) endonasal electrophoresis of intal.

4. Choose a physical treatment method indicated for relieving a mild asthma attack:

- a) galvanic "collar" according to Shcherbak;
- b) low-frequency magnetotherapy on the adrenal glands;

- c) diadynamic therapy paravertebrally on the thoracic region;
- d) shortwave therapy on the chest;
- e) red laser irradiation on the chest fields.

5. Indicate the most effective combination of techniques for infectious-obstructive bronchial asthma of moderate severity with signs of bronchitis and complaints of difficult expectoration:

- a) electrophoresis of euphyllin and inhalations of mucolytics;
- b) inhalation of proteolytic enzymes and transcranial UHF electric field;
- c) electrophoresis of antibiotics on the chest and inhalation of bronchospasmolytics;
- d) aerionotherapy and DMSO therapy on the adrenal glands;
- g) inhalation of mucolytics and transcranial UHF electric field on the lung roots.

6. Duration of halotherapy procedure in bronchial asthma:

- a) 5–10 min;
- b) 10–20 min;
- c) 30–60 min;
- d) 1–2 hours;
- e) 5–6 hours/

7. Choose the optimal physiotherapy method for bronchial asthma (acute phase, moderate severity, exacerbation of chronic bronchitis, decreased immune reactivity) with the aim of stimulating immunity and anti-inflammatory action:

- a) halotherapy;
- b) high-frequency magnetotherapy on the adrenal glands;
- c) autotransfusion of ultraviolet-irradiated blood;
- d) aerionotherapy.

Correct answers to the tests

1	2	3	4	5	6	7
a	d	b	c	g	d	c

Recommended literature

1. Order of the Ministry of Health of Ukraine No. 56 of 2008 "Protocols of sanatorium-resort treatment."
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GUIDELINES FOR PRACTICAL LESSON № 6

Physiobalneotherapy for joint diseases

Lesson objective:

- 1) to form an understanding of the pathogenetic mechanisms of the development of arthrosis and arthritis;
- 2) to be able to use the results of functional studies for differentiated prescription of physiobalneotherapy agents for arthrosis;
- 3) to know the features of applying physiobalneotherapeutic procedures for arthrosis and arthritis at the stages of rehabilitation (hospital, post-hospital);
- 4) to learn physiobalneotherapeutic procedures for osteochondrosis of the spine at the stages of rehabilitation (hospital, post-hospital).

Main stages of the lesson

- I. Assessment of the initial level of knowledge (oral questioning).
- II. Discussion of independently studied educational material.
- III. Completion of tasks and situational problems.

Theoretical information

Arthrosis is a degenerative-dystrophic joint disease, in which the pathological process primarily affects the articular cartilage, and with the progression of the disease, osteophytes (bone growths in the joint) are formed. The disease mainly affects the knee joints – gonarthrosis, hip joints – coxarthrosis, and spinal joints. Arthrosis is characterized by a latent onset of the disease course. The main etiological factor in the development of primary deforming arthrosis is mechanical damage to the articular cartilage caused by prolonged systematic overloading of the joints, constant microtraumatization, which is most characteristic for individuals performing heavy physical work, and athletes in certain sports, where large joints of the lower extremities and intervertebral joints of the spine are overloaded [1].

Rheumatoid arthritis. An infectious-allergic disease that is part of the complex syndrome of rheumatism. The development of the disease

is greatly influenced by focal acute and ionic streptococcal infection, as well as processes of sensitization of the body. The disease begins acutely and is characterized by all the signs of acute synovitis (the heart valves are affected simultaneously).

Symptoms. Severe pain and swelling in the joints, mainly in the knees, ankles, elbows, and wrists. Local temperature increase, pain when moving the joints, increased body temperature.

The goals of physiotherapy are to identify the general desensitizing effect, that is, to reduce the increased sensitivity of the body; increase the tone of the autonomic nervous system, demonstrate anti-inflammatory and analgesic effects on the joints, reduce vascular permeability, normalize body thermoregulation; increase general and local immunological reactivity, stimulate the activity of the adrenal cortex and protective reactions of the body; reduce "ultraviolet deficiency", normalize phosphorus and vitamin metabolism.

Hospital period of physiotherapeutic treatment of rheumatoid arthritis

Treatment should be comprehensive, systematic, and carried out at all stages of the disease. In the acute stage of the rheumatic process, along with therapeutic nutrition and drug therapy, the following are prescribed:

- 1) inductothermy on the adrenal gland area, 20–30 minutes, daily or every other day, in combination with erythematherapy;
- 2) ultraviolet irradiation of the collar zone according to Shcherbak or along the spine, 2–3 bioposies, every 1–2 days, 2–3 sessions per field;
- 3) diadynamic therapy of the joint area. First, the lateral surfaces are affected, and then the front and back, daily or every other day (for pain relief);
- 4) ultraviolet irradiation (in the absence of contraindications from the heart and lungs) of one or two joints per day, 4–6–10 bioposies, every 1–2 days, 3–5 sessions per joint;

- 5) general calcium electrophoresis according to Vermel. The anode is placed between the shoulder blades, 20–30 minutes, every other day.

After the hospital period of physiotherapeutic treatment

After the subsidence of acute inflammatory manifestations:

- 1) saline baths (36–37°C), 10–15 minutes, every other day.
- 2) electric light bath (solux) on the joint area, 15–20 min., daily;
- 3) ultrasound on the area of the joints, 8–10 min., every other day (alternating with the effect on the paravertebral area of the segmental zone);
- 4) general ultraviolet irradiation according to a delayed scheme, every other day;
- 5) oxygen tent, 20–40 min., 1–2 times a day, every day;
- 6) massage of the muscles of the lower limbs in the form of gentle vibrations, first of the proximal parts, and then of the periarticular tissues (to weaken reflex muscle hypertonus);
- 7) In case of chronic polyarthritis (4–6 months after a rheumatic attack) in order to provide an analgesic, absorbent, and hardening effect, at normal body temperature, ESR and the absence of a pathological process in the heart and lungs, the following are used:
 - hydrogen sulfide baths (50–100 mol/l, 35–36°C), 8–12 min., every other day or
 - general and local showers, wet wraps, rain shower, daily or every other day;
 - salt and sea baths (36–37°C), 10–15 minutes, every other day;
 - four-chamber galvanic baths, 15–20 minutes, every other day;
 - ultrasound to the joint area, 8–10 minutes, every other day (alternating with the influence on the paravertebral areas);
 - calcium-salicyl-electrophoresis general behind Vermel. Anode on the interblade area, 20 min., daily or every other day;
 - paraffin-ozokerite applications on the joint area (48–50°C), 20–30 minutes, every other day (in case of sweating) or

- mud applications (40–42°C) on the joint area, 15–20 min, every other day.

Acute arthritis (traumatic). Etiology and pathogenesis. The process develops as a result of penetration of purulent microbes into the joint during open injuries of the periarticular tissues or their transfer from a purulent focus. By the nature of the effusion, serous, serous-fibrinous, and purulent arthritis are distinguished. Symptoms. Joint swelling, tenderness and limited mobility, increased body temperature, regional lymphadenitis.

The task of physiotherapy is to identify the anti-inflammatory, analgesic effect that will accelerate the restoration of joint function; promote the elimination of intoxication.

Sick leave period of treatment

In the acute stage, after puncture and aspiration of the effusion, immobilization of the joint with a plaster cast. long-lasting for 7–12 days.

Antibiotics are prescribed for the treatment of joint inflammation.

1) Ultraviolet irradiation of the joint area is performed with 4–6 biologically effective doses every other day. When a cast is applied, the segmented (cellular or lumbar) area is irradiated with 3–4 biologically effective doses every 2 days.

2) Inductothermy is applied to the joint area using an electrode coil with a current strength of up to 200 mA for 15–20 minutes daily or

3) Microwave therapy is applied transversely to the joint area for 8–10 minutes daily or

4) Pulsed microwave therapy is applied to the joint area. Gap distance is 2–3 cm, anodic current strength is 10–12 mA, pulse duration is 2 microseconds, and treatment duration is 10–15 minutes daily (after trauma or surgery). Similar treatment is also performed after joint surgery (arthrotomy or resection) starting from the 3rd day.

Two weeks after the acute inflammatory symptoms subside, the following treatments are applied:

1) Electrosplint bath is applied to the joint area for 20 minutes daily or

2) Solux and infrared radiation are applied to the joint area for 15–20 minutes 1–2 times a day;

3) General ultraviolet irradiation is applied according to the main scheme every other day.

In the chronic stage of arthritis with normal temperature and ESR, the following treatments are recommended:

1) Mud applications are applied to the joint (40–42°C) for 20–30 minutes every other day or

2) Paraffin-ozokerite applications are applied to the joint (48–52°C) for 20–30 minutes daily or every other day;

3) Iodine electrophoresis is applied transversely to the joint area for 30 minutes daily or every other day, alternating with hyposulfite electrophoresis;

4) Hyaluronidase or lydas electrophoresis is applied to the joint area for 15–20 minutes daily or every other day;

5) Shavliev baths (34–35°C) are taken for 10–15 minutes every other day or

6) Iodobromine baths (35–37°C) are taken for 10–15 minutes every other day or

7) Ultrasound therapy is applied around the joint. The mode is continuous, direct contact, with a mobile technique, dose of 0.4–0.6 W/cm², for 7 minutes daily or every other day.

Deforming arthrosis. Etiology and pathogenesis. Age-related metabolic and endocrine disorders cause changes in the structure and function of joints. Articular cartilage loses elasticity, thins, and then partially necrotizes; bone surfaces are exposed in some areas. Favorable factors include single or minor but frequent repetitive trauma, and endocrine disorders.

Symptoms. When moving the joint, there is a crunch and a feeling of discomfort, pain when loading, forced frequent change of joint position, stiffness in the joint after sleep. On the X-ray, there is a narrowing of the joint space and deformation of the joint edges.

The goal of physiotherapy (used in the initial stage) is to identify the analgesic effect, prevent the progression of the degenerative process, and restore joint function.

Hospital period of physiotherapy for arthrosis

1) Ultraviolet irradiation of the joint area, 4–6 biodoses, every 1–2 days; course – 3–4 sessions.

2) Ultrasound on the joint area and paravertebral segmental zone.

3) Paraffin-ozokerite applications on the joint area (48–52°C), 20–30 minutes, daily.

4) Mud applications on the joint area (42°C), 20–30 minutes, every other day.

5) Potassium chloride electrophoresis on the joint area, 10–20 minutes, daily or every other day.

6) Hydrocortisone phonophoresis on the joint area. The joint area is lubricated with hydrocortisone emulsion and exposed to ultrasound, 7–10 minutes, daily or every other day.

7) Diadynamic therapy of the joint area, daily or every other day.

8) Inductothermy on the adrenal gland area, 10–15 minutes, daily or every other day.

9) Pulsed UHF therapy on the joint area. Patient's position is sitting or lying down. Gaps – 2–3 cm, anodic current strength – up to 10–15 mA, pulse duration – 2 microseconds, session duration – 10–15 minutes, daily or every other day (especially recommended for elderly individuals; the effect is enhanced when combined with intra-articular administration of hydrocortisone).

10) Microwave therapy of the joint area, 10–15 minutes, daily or every other day.

11) Iodobromine baths (36–37°C), 15 minutes, every other day or.

12) Sage baths (36–37°C), 10–15 minutes, every other day or.

13) Hydrogen sulfide baths (concentration 100–200 mg/l, 33–35°C), radon baths (34–36°C) (concentration – 100–150 units), 10–15 minutes, every other day (for polyarthritis).

Procedures that increase metabolism, tone the nervous system, and normalize basic processes are most recommended for elderly individuals: general or local iodine electrophoresis, nitrogen or oxygen baths, oxygen tent, climate therapy (prolonged stay in the open air, bathing), therapeutic exercises; for accompanying peripheral nervous system disorders – diadynamic therapy, novocaine electrophoresis, inductothermy.

Sanatorium treatment of arthritis and arthrosis

For the treatment of osteoarthritis in sanatorium conditions, local standardized protocols approved by the Order of the Ministry of Health of Ukraine [5] are used. Sanatorium doctors use them when prescribing a course of sanatorium rehabilitation treatment. In the absence of signs of process activity or in the presence of mild activity (stage I):

Therapeutic exercises: in a relaxed state; in water (hydrokinesiotherapy) in a pool with fresh, sea, or brackish water, at a temperature of 32–34°C, with a duration of 15–20 minutes initially with subsequent increase in duration to 45–60 minutes, every other day, for a course of 10–12 procedures.

Massage: manual and underwater, vacuum, vibro- and baromassage; a total of 10–12 procedures, daily or every other day.

Balneotherapy: (independently or in combination with physiotherapy, reflexotherapy):

- coniferous baths at a temperature of 36°C, for 10–12 minutes, every other day, for a course of 10–12 procedures.
- sulfide baths with a gradual increase in hydrogen sulfide concentration of 50–100–150 mg/l, at a temperature of 36°C, for 10–12 minutes, every other day, for a course of 10–12 procedures.
- radon baths with a radon concentration of 0.75–1.5 kBq/l, at a temperature of 36°C, for 10–12 minutes, every other day, for a course of 10–12 procedures.

Mud therapy and thermotherapy: (isolated or in combination with physiotherapy, reflexotherapy).

mud applications on the affected joint area in the form of "socks", "gloves", "stockings", "pants", etc., and reflexogenic zones (cervical-

collar and lumbar regions), at a temperature of 38–40–42°C, for 10–12 minutes, every other day, for a course of 10–12 procedures.

paraffin treatment: by cuvette-application method or layering method on the affected joint area, at a temperature of 55–60°C and a layer of paraffin 1–2 cm thick, for 30–60 minutes, for a course of 12–20 procedures, every other day or daily.

Ozokerite treatment: by the method of cuvette application or layering on the affected joint area, at a temperature of 48–50°C, with an exposure duration increasing from 15 to 30 and up to 60 minutes, for a course of 10–15 procedures, every other day or daily.

Hardware physiotherapy (mono- or bifactorial): laser irradiation of the affected joints in the red (632.8 nm) and infrared (890 nm) range, UV irradiation. Laser therapy with red light (wavelength 632.8 nm) is performed at an initial radiation power of 20–40 mW and power density (PD) of 2–3 mW/cm² (0.5–1.0–1.5 J/cm²) for a duration of 20 seconds to 3 minutes per field (or 2 minutes per acupuncture point), with a total session duration of up to 20 minutes, daily or every other day, for a course of 10 procedures. Laser therapy with infrared light (wavelength 890 nm) is performed at an initial radiation power of 20–40–60 mW and PD of 5 mW/cm², with a frequency of up to 150 Hz, in continuous or pulsed mode, for a duration of 20 minutes, daily or every other day, for a course of 10 procedures.

- medium-frequency ultrasound (880 kHz) and low-frequency ultrasound (22 kHz and 44 kHz). Ultrasound exposure to the joint area is performed at a frequency of 880 kHz in continuous or pulsed mode using a stable or labile technique, with a PD of 0.05–0.8 W/cm², for a session duration of 15 minutes daily or every other day, for a course of 6–12 procedures.

Low-frequency ultrasound (22 kHz and 44 kHz) is applied to the joint area in pulsed mode, with an amplitude of 2–5 μm (exposure 2 seconds, pause 5 seconds), for a duration of 10–15 minutes, for a total of 8–10 procedures daily or every other day.

- ultrasound phonophoresis (the technique of ultrasound exposure is described above) with 2.5% hydrocortisone ointment; "Cortan" (a

mixture of 0.5–1% hydrocortisone ointment and 10% analgin), "Pelan" (a mixture of 10 g of analgin, 40 ml of mud solution, 40 g of anhydrous lanolin, 10 g of vaseline); 30% ichthyol ointment, chondroside; Dolobene gel, Dolgit cream, DIP-Relief gel, Fastum gel, etc.

- electrophoresis with a current density of 0.05–0.1 mA/cm²: mixtures of 10% analgin solution with 50% dimexide solution; mixtures of 10% analgin solution with 25% dimexide solution; 64 U of hyaluronidase solution; 1–2% thiophosphamide solution; Applied to the affected joint area, procedure duration of 15–20 minutes, daily or every other day, for a course of 10 procedures.

- Magnetotherapy with the placement of magnetic inductors on the affected joint area. Continuous magnetic field with an intensity of 40–60 mT, procedure duration of 15–30 minutes, daily or every other day, for a course of 15–20 procedures. Variable magnetic field with an intensity of 25–35 mT, in continuous or intermittent mode (frequency of 50 Hz), session duration of 15–20 minutes, daily or every other day, for a course of 15–20 procedures.

- SMV therapy with the placement of emitters on the affected joint area, using contact or distant method with a gap of 5–7 cm, power of 30 W, session duration of 4–10 minutes, daily or every other day, for a course of 5–12 procedures.

- DWT therapy with the placement of emitters on the affected joint area, with a gap of 3–4 cm, power of 30 W, using contact method of 5–8–15 W, session duration of 8–10 minutes, for a course of 8–12 procedures.

- Diadynamic therapy (DDT) with transverse placement of electrodes; the affected joint is influenced in DN mode for 2 minutes, then in CP mode for 3 minutes in direct polarity and CP mode for 3 minutes in reverse polarity, daily or every other day, for a course of 15–20 procedures.

- Duration of sanatorium treatment: 18–24 days.

Spinal osteochondrosis (spondyloarthrosis) is a chronic pathological process in the intervertebral joints of the spine, in which there is destruction of the intervertebral disc (the disc narrows, loses

elasticity and mobility, protrudes into the spinal canal). With the progression of the disease, pathological changes spread to the bodies of adjacent vertebrae and the ligamentous apparatus [3]. Comprehensive treatment of degenerative joint diseases, along with medication treatment and increasingly frequent surgical interventions, involves the wide use of physical rehabilitation methods at all stages of rehabilitation for patients with arthritis.

Etiology and pathogenesis. As a result of degeneration of the cervical discs, secondary reactive processes develop in the spine – deformed hook-like processes compress the vertebral artery and spinal nerve, causing pronounced cerebral disorders. Trauma and infections play a provoking role in the development.

Symptoms. The clinic is polymorphic. Characteristic are pain in one half of the head, visual and auditory disturbances, vestibular dysfunction; "cracking", "creaking" in the neck during movement, radicular syndrome, etc. X-ray of the cervical spine shows deformation of the intervertebral joints.

The tasks of physiotherapy are to identify analgesic, anti-inflammatory, trophic effects, as well as to achieve the elimination of cerebral and radicular symptoms.

In addition to prescribing medications (vitamins of group B, aloe, etc.), the following are recommended:

1) Novocain or iodine electrophoresis on the neck area. One electrode with a pad of 6×8 is placed on the upper cervical spine, another with a pad of 8×12 is placed on the front of the neck, current strength – 5–8 mA, 10 minutes, daily or every other day (effective alternation with diathermy or UHF field);

2) Diathermy (inductothermy) on the upper cervical spine area (the same technique as with electrophoresis), current strength – 0.3–0.5A, 10 minutes, every other day or daily or

3) UHF field on the cervical spine area transversely, low thermal dose, 8–12 minutes, daily or every other day or

4) Microwave therapy of the cervical spine area, 10 minutes, daily or every other day;

- 5) Diadynamic therapy of the neck area paravertebrally, 8–10 minutes, daily or every other day;
- 6) Ultrasound therapy of the cervical spine area, up to 5 minutes, every other day;
- 7) Vibrational baths (36–37°C). They affect the collar zone through a layer of water, frequency of oscillations – 100 Hz, pressure – 3–4 thousand bar, 3–5 minutes, every other day. The course of treatment is up to 15 procedures (in case of subacute and chronic course of the disease and the absence of angina pectoris, stage II hypertension, spinal compression, cerebral vascular sclerosis or trauma);
- 8) Radon baths (concentration – 100–150 units, 35–36°C), 15 minutes, daily or every other day;
- 9) Hydrogen sulfide baths (concentration – up to 100 mg/l, 34–36°C), 8–10 minutes, every other day;
- 10) Mustard plasters on the neck-occipital area or a bag with heated sand under the neck overnight.

Questions for self-preparation and control of knowledge level on the topic

1. Define osteoarthritis. List the etiological factors of osteoarthritis.
2. Describe the changes that occur in the joint during the progression of osteoarthritis.
3. Describe the features of rheumatoid arthritis.
4. What are the differences between arthritis and osteoarthritis?
5. What examination methods does a physical therapist use to establish a rehabilitation diagnosis, prognosis, and rehabilitation intervention plan for osteoarthritis?
6. What tasks is physiotherapy aimed at solving during the hospital period of rehabilitation for spinal osteochondrosis?
7. Describe physiotherapy during the exacerbation of osteochondrosis in the cervical and lumbosacral spine.
8. The objectives of physical therapy in the post-hospital period of rehabilitation for spinal osteochondrosis.
9. The main objectives of physiotherapy for arthritis.

10. What physiotherapy methods are used for analgesic and resorptive effects in chronic polyarthritis?
11. The following physiotherapy methods are used two weeks after the subsidence of acute inflammatory manifestations in acute arthritis.
12. The main symptoms of deforming arthrosis.
13. What physiotherapy methods are used in the initial stage of deforming arthrosis?
14. What physiotherapy methods are used for elderly individuals with deforming arthrosis?
15. What is the cause of spinal osteochondrosis?

Task 1. Familiarize yourself with questionnaires for assessing the functional state of patients with joint problems, presented in tables and other methods of joint research.

Methods of joint research.

To determine the severity index of gonarthrosis and for a more in-depth study of the characteristics of symptoms, characteristics of functional disorders, and the level of knee joint damage, a questionnaire is used to calculate the Leken index [7]. The Leken index is a questionnaire for self-completion by patients, which assesses three indicators – pain; walking ability, maximum pain-free walking distance; functional joint activity in everyday life (table 1, 2). The severity of gonarthrosis is determined by the sum of points: 1–4 – mild; 5–7 – moderate; 8–10 – severe; 11–12 – significantly severe; more than 12 – extremely severe. It should be noted that this test was recommended by the European League Against Rheumatism as a criterion for effectiveness in conducting clinical studies in patients with osteoarthritis [7, 9].

Table 1

The total Leken index to assess the functional activity of patients with arthrosis of the hip joint (severity index for coxarthrosis)

1. Pain or discomfort	Score
Pain at night	
- no	0
- only with movements and in some positions	1
- even without movement	2
Morning stiffness or pain after getting out of bed	
- no or less than 1 minute	0
- less than 15 minutes	1
- 15 minutes and more	2
Increased pain standing for 30 minutes	
- no	0
- yes	1
The pain when walking	
- it doesn't occur	0
- occurs when you walk some distance	1
- it arises from the very beginning and then only intensifies	2
2. Maximum walking distance without pain:	
- there are no restrictions	0
- more than 1 km, but there are difficulties	1
- about 1 km	2

Table 2

The total Leken index to assess the functional activity of patients with arthrosis of the hip joint (severity index for coxarthrosis)

1. Pain or discomfort	Balls
Pain at night	
- no	0
- only with movements and in some positions	1
- even without movement	2
Morning stiffness or pain after getting out of bed	
- no or less than 1 minute	0
- less than 15 minutes	1
- 15 minutes and more	2

Increased pain standing for 30 minutes	
- no	0
- yes	1
The pain when walking	
- it doesn't occur	0
- occurs when you walk some distance	1
- it arises from the very beginning and then only intensifies	2
2. Maximum walking distance without pain:	
- there are no restrictions	0
- more than 1 km, but there are difficulties	1
- about 1 km	2
- from 500 to 900 m	3
- from 300 to 500 m	4
- from 100 to 300 m	5
- less than 100 m	6
- with one stick or a crutch	+1
- with two stick or a crutch	+2
3. Functional activity behind the gradations of responses	
You could climb one span on the steps	0–2
You could go down one span on the steps	0–2
You could clean the bottom shelf of the cabinet, kneeling	0–2
You could walk on an uneven road	0–2
Do you feel a sharp pain or a sudden feeling of loss of support in the injured limb	
- sometimes	1
- often	2
Total index balls	
Gradations of answers: freely – 0, with difficulty – 1, impossible – 2	
The severity of gonarthrosis: 1–4 balls – weak; 5–7 balls – average; 8–10 balls – expressed; 11–12 balls – substantial; more than 12 – sharply pronounced	

Determining the range of motion in the joints is one of the important indicators in osteoarthritis. It is carried out both to determine the "initial" level of musculoskeletal disorders and to monitor the dynamics of the indicator during physical rehabilitation [9, 11].

The range of motion is usually assessed on a six-point scale: 5 points – normal range of motion, in full; 4 points – range of motion preserved at 75%; 3 points – range of motion preserved at 50%; 2 points – range of motion preserved at 25%; 1 point – minimal range of motion; 0 points – no movement.

Measurement of joint movements is most commonly done using a goniometer. When measuring movements in the knee joint, the starting value is taken as 180°, and the average normal range of motion is considered to be 130° of flexion and 0° of extension.

To determine swelling in the affected joint, objective measurement is done by measuring the circumference of the joint using a centimeter tape. This method is most commonly used for measuring the circumference of the knee joint. It is recommended to take measurements at multiple levels – 3 cm above, in the middle, and 3 cm below the patella. The data should be compared with the measurements on the unaffected limb to monitor the recovery process.

To assess the functional status, functional impairment (FI) and functional class (FC) are determined. The following gradation of joint functional ability (functional impairment) is accepted: FI 0 – joint function preserved; FI I – temporary loss of working capacity; FI II – loss of working capacity; FI III – patient requires external assistance [7].

A simple and informative tool for evaluating treatment effectiveness is a questionnaire that asks only one question: how do you evaluate the results of the treatment: "improvement", "no effect", "deterioration". The answers are provided by the doctor and the patient. One of the basic examinations for musculoskeletal disorders, including osteoarthritis, is joint X-ray [9]. In Figure 1 of the X-ray examination, a significant deformation and narrowing of the joint space of the knee joint can be clearly seen (indicated by arrows and dashed lines), when the question of surgery arises, as movements in the joint are practically impossible.



Fig. 1. Osteoarthritis of the knee joint

Nowadays, ultrasound examination of the knee joints [4] (Fig. 2, 3) is equally important for the diagnosis of osteoarthritis, where the examination technique can be seen and compared with the CT image.



Fig. 2. Ultrasound examination of the knee joint and CT of the knee joint

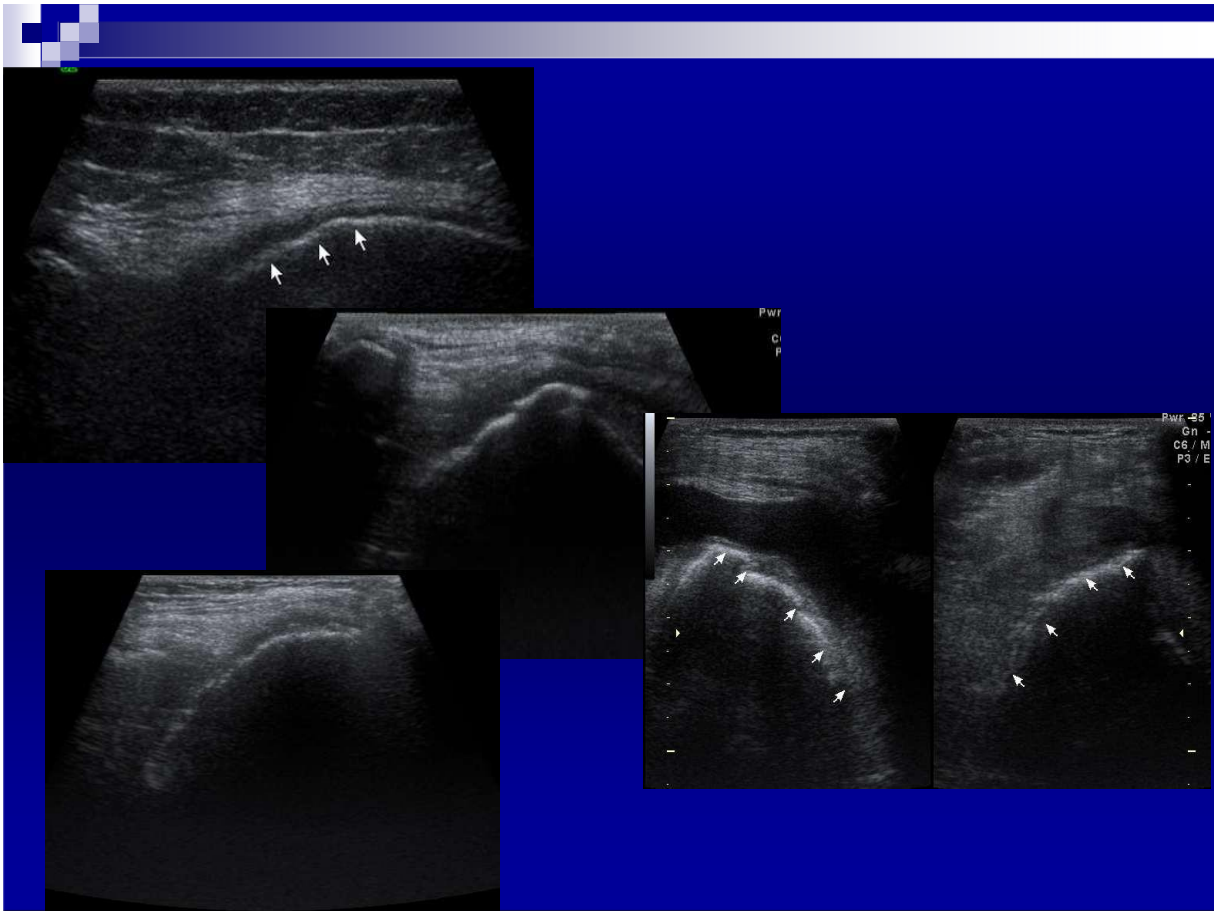


Fig. 3. Grade III osteoarthritis on ultrasound examination of the knee joint. Significant thinning of the cartilage, presence of fluid in the joint, calcification, and multiple osteophytes on the joint surfaces can be seen

Task 2. Master and learn to prescribe physiotherapeutic and balneological treatment for degenerative-dystrophic joint diseases.

Algorithm for performing the task: one student plays the role of a physical therapist, the other plays the role of a patient. The patient talks about their problems and complaints; the student in the role of a physical therapist prescribes physiotherapeutic treatment. After completing the task, the students switch roles.

Task 3. Solving situational problems.

Problem 1. Patient Olga S., 54 years old. She consulted a doctor with complaints of pain in the lower back, limited movement in the lumbar spine, periodic increase in blood pressure to 165/95 mm Hg. According to the results of objective, subjective, and radiological examinations, the patient was diagnosed with "Osteochondrosis of the

lumbar spine." Develop a tentative rehabilitation program, taking into account the presence of hypertension.

Problem 2. Patient L., 44 years old: Diagnosis: coxarthrosis of the right hip joint (exacerbation stage of the disease). Undergoing a course of conservative treatment in a hospital setting.

1. Formulate the main tasks of physical therapy in rehabilitation.
2. Determine the indications and terms for prescribing physiotherapy.
3. Determine the effectiveness of physical rehabilitation methods in complex therapy.

Problem 3. Patient K., 58 years old, after consulting a doctor with complaints of knee pain, heaviness in the legs during walking, rapid fatigue, was diagnosed with "Rheumatoid arthritis; hypertension of the II degree." As part of the treatment measures, physical therapy, ozokerite on the knee joints, and therapeutic massage were prescribed.

1. Specify the sequence of application of the prescribed procedures.
2. Justify the appropriateness of prescribing these rehabilitation methods, based on the goals of physical rehabilitation at this stage.
3. Make additions or corrections if necessary.

Problem 4. Patient K., 41 years old. Diagnosis: rheumatoid arthritis (subacute stage). Undergoing a course of conservative therapy in a hospital setting.

1. List the main tasks of physical rehabilitation in complex treatment.
2. Select the means of physical rehabilitation to prevent joint stiffness.

Task 5. Patient V., 22 years old. Diagnosis: rheumatoid arthritis.

Undergoing inpatient treatment (15th day).

- a) Formulate the tasks of physiotherapy.
- b) How to determine the effectiveness of physical therapy in the described clinical case?

Task 4. Performing test tasks for final control.

Choose one correct answer:

1. Changes in the development of arthrosis usually occur in:

- a) bone tissue of the joint;
- b) synovial membrane;
- c) articular cartilage.

2. The duration of complete restoration of damaged cartilage is:

- a) 3–6 months;
- b) 1 month;
- c) 1–2 months.

3. Osteophytes are:

- a) tendon growths;
- b) marginal bone growths;
- c) changes in the synovial membrane in arthrosis.

4. Arthrosis is characterized by:

- a) rapid development;
- b) slow development;
- c) unnoticed development.

5. Choose the correct statement:

- a) physiotherapy for osteochondrosis localized in the cervical spine is prescribed from the acute period of the disease;
- b) active movements of the neck are contraindicated during the acute period of osteochondrosis in the cervical spine;
- c) active balneotherapy is used.

6. The unloading positions that help reduce muscle tension and pain in lumbar osteochondrosis do not include the position:

- a) lying on the side with bent legs at the hip joints;
- b) lying on the back with bent legs at the hip joints and the shins resting on a support or soft roller;
- c) semi-sitting and standing.

7. During the exacerbation of osteochondrosis, initial positions that relieve the spine are recommended, namely:

- a) lying on the back, lying on the stomach, lying on the side;
- b) sitting;
- c) standing.

8. In the acute period of lumbar osteochondrosis, the following procedures are prohibited:

- a) ozokerite therapy;
- b) magnetotherapy;
- c) taping of the lumbar spine.

9. Choose the correct statement.

a) It is important to adhere to a diet with limited protein in gouty arthrosis;

b) In the acute period of osteoarthritis, ozokerite treatment is actively used in treatment;

c) Balneotherapy is not prescribed in the rehabilitation sanatorium treatment of arthrosis.

10. In the post-hospital period, patients with osteochondrosis are not recommended to:

a) Sleep on a firm bed, on their back without a pillow;

b) Walk long distances and take long walks;

c) Avoid sudden movements, forward bends, lifting heavy objects, and asymmetrical movements in everyday activities.

Correct answers to the tests

1	2	3	4	5	6	7	8	9	10
c	a	b	c	a	c	a	a	a	c

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Електронне навчально-методичне видання

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