

ЛД-16 ИИ

Federal State Budgetary Educational Institution  
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North Ossetian State Medical Academy "  
Ministry of Health of the Russian Federation

Methodical recommendations for practical training in discipline  
Medical rehabilitation

the main professional educational program of higher education - specialty program in the  
specialty 31.05.01 General Medicine, approved in February 26, 2021

Form of education \_\_\_\_\_ Full-time \_\_\_\_\_

The period of development \_\_\_\_\_ 6 \_\_\_\_\_

Department of Psychiatry with Neurology, Neurosurgery and Medical Rehabilitation

TOPIC: Electrotherapy. Constant and alternating currents.

## **I. Scientific and methodological justification of the topic.**

Intact human skin has a high ohmic resistance and low electrical conductivity ( $10^3$ - $2 \cdot 10^4$   $\Omega \cdot \text{cm}$ ), so the current enters the body mainly through the excretory ducts of sweat and sebaceous glands, intercellular cracks. In the body, under the influence of current, various reactions of a local, segmental or generalized nature occur. They depend on the parameters of exposure, the initial functional state of the body and the location of the electrodes. The redistribution of ions, the accumulation of electrolysis products, the formation of biologically active substances, as well as the direct action of current on nerve endings and receptors lead to the emergence of nervous afferent impulses. This is manifested by strengthening the regulatory and trophic functions of the nervous system, improving blood supply and metabolism in the brain, accelerating the regeneration of damaged nerve structures.

## **II. The purpose of students' activity in the classroom.**

**The purpose of the lesson: mastering theoretical knowledge of the therapeutic effect of direct and alternating electric currents**

**Tasks: to teach students:**

- to justify the choice of a method of treatment with direct and alternating electric currents, taking into account existing indications and contraindications to their use**
- to apply physiotherapeutic methods of treatment with direct and alternating electric currents in the complex rehabilitation of patients**
- the main methods of safe work with patients when using devices for electrotherapy/**

**The student should know:**

- 1. Physico-chemical reactions in tissues under the cathode (cataelectron) and anode (anaelectron) under the action of direct current**
- 2. Mechanisms of therapeutic action of continuous and pulsed direct and alternating currents on biological tissues**
- 3. Devices and methods of application of continuous and pulsed direct and alternating currents in the methods of electrospection, galvanization, therapeutic electrophoresis, Bernard currents (DDT), sinusoidal modulated current (SMT)**
- 4. Indications and contraindications for the appointment of treatment with continuous and pulsed direct and alternating currents**
- 5. Mechanisms of therapeutic action and indications for the use of dorsanvalization, inductothermy, UHF, microwave therapy, magnetotherapy**
- 6. Devices and methods of application of dorsanvalization, inductothermy, UHF, microwave therapy, magnetotherapy**
- 7. Indications and contraindications for the use of dorsanvalization, inductothermy, UHF, microwave therapy, magnetotherapy**

**The student must be able to:**

- 1. Examine the patient using anamnesis data, external examination, physical examination, laboratory and instrumental methods**
- 2. To evaluate the changes detected during the examination by various organs and systems**
- 3. Choose the FTL option taking into account the established diagnosis and side effects of treatment.**
- 4. Provide first aid in acute and urgent conditions:**
  - in case of exacerbation of chronic diseases on the background of FTL**
  - in case of electric trauma of staff and/or patient**

**III. The content of the training.**

**Theoretical foundations of the mechanism of action of physical factors. Absorption of energy of physical factors by the body. Primary (physico-chemical) bases of the action of physical factors. Reflex mechanism of action of physical factors. The direct effect of physical factors on organs and tissues. The main ways and features of the action of physical factors on the most important functional systems of the body. The effect of physical factors on pathological and systemic reactions of the body (reactivity, allergy, inflammation, pain, trophic, etc.). The significance of the initial functional state, the nature of the pathological process and the conditions of exposure to physical factors. Specific and non-specific effect of physical therapeutic factors. Electrotherapy. Constant electric current. Electricity and its therapeutic and preventive use. The human body as a conductor of electric current. Current distribution in the human body. Electrical conductivity of tissues. Electricity as a biological stimulus. Electroplating and medicinal electrophoresis. The physiological effect of direct current. The phenomenon of polarization in tissues.**

Pulse currents of direct and alternating direction. The form of pulse currents, their therapeutic and diagnostic use. Electrostimulation, dyadinamotherapy (DDT), electroson, transcranial electroanalgesia

**IV. A list of laboratory work, visual aids, TSO tools.**

**IV. Tables, slides.**

**V. Codoscope, slidoscope.**

**VI. Independent work of students.**

**1. Curation of patients under the supervision of a teacher in the physiotherapy department**

**2. Independent appointment of treatment depending on the diagnosis, complications, indications and contraindications to FTL in the supervised patient**

**3. Work with medical documentation (a list of prescriptions containing data on the area of exposure, duration, technical parameters of the applied method of physiotherapy treatment)**

**4. Working with literature**

#### **VII. Chronocard of the training session**

**1. Checking the initial level of students' knowledge on this topic, taking into account the information they received in the 3rd year – 30 min.**

**2. Independent work of students with supervised patients in the hospital department and medical histories – 30 min.**

**3. Discussion of the topic of the lesson using case histories of supervised patients, educational case histories, sets of tables, drawings, diagrams illustrating the topic - 60 min.**

**4. Students' analysis of physiotherapy of 1-2 supervised patients, taking into account the topic of the lesson – 60 min.**

**5. Verification of students' assimilation of the lesson topic (control of the final level of knowledge).**

#### **VIII. Literature.**

**The main recommended literature:**

**1. Bogolyubov V.M., Ponomarenko G.N. General physiotherapy. Textbook.- Moscow. Medicine - 2003 - 430 p.**

**2. Ponomarenko G.N. General physiotherapy. Textbook. M. GEOTAT - Media, 2012. - 368s.**

**Additional recommended literature:**

**1. Vygodner E.B. Physical factors in gastroenterology— - M., 1987.**

**2. Gurlenya A.M., Bagel G.E. Physiotherapy and balneology of nervous diseases. - Mn., 1989.**

**3. Dovzhansky SI., Orzheshkovsky V.V. Physiotherapy of skin diseases. - Saratov, 1986.**

**4. Efanov O.I., Dzanagova T.F. Physiotherapy of dental diseases— M., 1980.**

5. Kirichinsky A.R. Reflex physiotherapy. - Kiev, 1959.
6. Clinical physiotherapy / Edited by V.V. Orzheshkovskiy. - Kiev, 1984.
7. Clinical physiotherapy / Ed. by I.N. Sosin. - Kiev, 1996.
8. Klyachkin L.M., Vinogradova M.N. Physiotherapy. - M" 1995.
9. Klyachkin L.M., Malyavin A.G., Ponomarenko G.N., etc. Physical methods of treatment in pulmonology. - St. Petersburg, 1997.
10. Komarova L.A., Blagovidova L.A. Manual of physical methods of treatment. - L., 1983.
11. Leshchinsky A.F., Ulashchik B.C. Complex use of medicines and physical therapeutic factors in various pathologies. — Kiev, 1989.
12. Levenson A. R. Electromedical equipment. — M., 1981.
13. Lomachenko V. D., A. K. Stralis Physical therapy in pulmonary tuberculosis.— M., 2000.
14. Medical rehabilitation: a Guide in 3 vols /ed. by V. M. Bogoliubov. — M., 1998.
15. Ponomarenko G. N. Physical treatment: a Handbook. - St. Petersburg, 2002.
16. "Safety rules for the operation of medical devices in healthcare institutions. General requirements". - Approved by the Ministry of Health of the USSR 27.08.85 - M., 1985.
17. Manual on physiotherapy and physioprophylaxis of childhood diseases / Edited by A.N. Obrosova, T.V. Kara-chevtseva. - M., 1987.
18. Sorokina E.I. Physical methods of treatment in cardiology. - M., 1989.
19. Sosin I.N., Levchenko O.G. Physiotherapy of eye diseases.- Tashkent, 1988.
20. Techniques and methods of physiotherapy procedures: Handbook / Edited by V.M. Bogolyubov— - M., 2002.
21. Ulashchik B.C. Theory and practice of medicinal electrophoresis. - Mn., 1976.
22. Ulashchik B.C. Introduction to the theoretical foundations of physical therapy. - Mn., 1981.

- 23. Ulashchik B.C. New methods and techniques of physical therapy. - Mn., 1986.**
- a. Ulashchik B.C. Home physiotherapy. - Mn., 1993.**
- 24. Fadeeva N.I., Maksimov A.I. Fundamentals of physiotherapy in pediatrics: Reference manual. - Nizhny Novgorod, 1997.**
- 25. Chirkin A.A., Bogdanovich L.I., Ulashchik B.C. Ultrasound and reactivity of the body. - Mn., 1977.**
- 26. In the city of ki V.G. Electrotherapy. - M., 1987.**

**TOPIC: Electrotherapy. High-frequency electrotherapy**

**I. Scientific and methodological justification of the topic.**

**Among modern methods of physiotherapy, a significant place is occupied by methods of high-frequency electrotherapy, which are based on the effect on the body of alternating currents, electromagnetic fields or their components (i.e. electric and magnetic fields) of high, ultra-high and ultra-high frequency. All methods of high-frequency electrotherapy have common features, which allows them to be attributed to one section of physiotherapy.**

**Firstly, the main operating factor of all methods of high-frequency therapy is considered to be alternating current, which is either directly supplied to the patient's body (darsonvalization, ultratonotherapy), or occurs in tissues and body environments under the influence of variable high-frequency fields.**

**Secondly, the method of obtaining the active factor is common. For this purpose, high-frequency electrotherapy devices use an oscillatory circuit (Fig. 22) or its varieties (magnetron, etc.).**

**Thirdly, the mechanism of action of these factors on the body is similar in many ways. As is known, the basis of the physiological and therapeutic effect of high-frequency electrical oscillations is their interaction with electrically charged particles of biological tissues. It is accompanied by non-specific, or thermal, and specific, or oscillatory (extrathermal) effects.**

#### **I. The purpose of the student's activity in the classroom**

**The purpose of the lesson: mastering the theoretical knowledge of the therapeutic effect of high-frequency electrotherapy**

**Tasks: to**

**teach students:**

- to justify the choice of the treatment method of high-frequency electrotherapy, taking into account the existing indications and contraindications to their use**
- to apply physiotherapeutic methods of treatment of high-frequency electrotherapy in the complex rehabilitation of patients**
- the main methods of safe work with patients when using devices for electrotherapy**

#### **IV. Перечень лабораторных работ, наглядных пособий и средств ТСО.**

**The student should know:**

- 1. Physico-chemical reactions in tissues under the cathode (cataelectron) and anode (anaelectron) under the action of high-frequency electrotherapy**
- 2. Mechanisms of therapeutic effect of high-frequency electrotherapy on biological tissues**
- 3. Devices and methods of application of high-frequency electrotherapy: ultratono therapy, darsonvalization, inductothermy, UHF therapy, DMV therapy, MMV therapy, EHF therapy.**
- 4. Indications and contraindications for the appointment of treatment of ultratono therapy, darsonvalization, inductothermy, UHF therapy, DMV therapy, MMV therapy, EHF therapy.**

**The student must be able to:**

- 1. Examine the patient using anamnesis data, external examination, physical examination, laboratory and instrumental methods**
- 2. To evaluate the changes detected during the examination by various organs and systems**
- 3. Choose the FTL option taking into account the established diagnosis and side effects of treatment.**
- 4. Provide first aid in acute and urgent conditions:**
  - in case of exacerbation of chronic diseases on the background of FTL**
  - in case of electric trauma of staff and/or patient**

### **III. The content of the training.**

**Electric currents of high voltage and frequency. Biophysical bases of action. Darsonvalization. Ultratono therapy. Electromagnetic field of high and ultrahigh frequencies. UHF, Inductothermy. UHF inductothermy. Microwave (DMV, SMV). EHF therapy. Mechanical vibrations of the medium. Ultrasound therapy. Physical characteristics of factors. The mechanism of therapeutic action.**

**Indications and contraindications to the appointment. Principles of dosing. Therapeutic techniques. Compatibility with other methods of physiotherapy.**

**V. Analysis of patients' medical histories**

**VI. Checking the initial and final level of knowledge.**

**1. In the method of therapeutic effect, called "darsonvalization" is used**

- a) alternating electric field**
- b) low-frequency alternating current**
- c) low voltage direct current**
- d) alternating high-frequency pulse current of high voltage and low power**
- e) electromagnetic field**

**2. When exposed to Darsonval current, always apply**

- a) two electrodes**
- b) three electrodes**
- c) four electrodes**
- d) solenoid**
- e) one electrode**

**3. Darsonval current is capable of**

- a) reduce the sensitivity of the nerve receptors of the skin**
- b) cause irritation of receptors in the muscle, causing its contraction**
- c) to suppress the processes of exchange**
- d) reduce regeneration**

**e) cause hypothermia of the skin**

**4. When a high-frequency alternating magnetic field is applied in human tissues,**

**a) vibrational vortex motions of electrically charged particles**

**b) processes of stable polarization of charged particles**

**c) the movement of electrically charged particles in one direction**

**d) resonant absorption by water molecules**

**e) cavitation processes**

**5. During inductothermy, the most active energy absorption occurs**

**a) in muscles and parenchymal organs**

**b) in the bones**

**c) in the skin**

**d) in adipose tissue**

**e) in connective tissue**

**6. Inductothermia is contraindicated for treatment**

**a) prolonged pneumonia**

**b) coronary heart disease in functional class III-IV**

**c) chronic salpingoophoritis in the stage of infiltrative-spastic changes**

**d) chronic hepatitis**

**e) arthrosis of the knee joint**

**7. The active physical factor in UHF therapy is**

- a) direct current**
- b) alternating ultra-high frequency electric field**
- c) pulse current**
- d) constant high voltage field**
- e) alternating electric field of low frequency**

**8. The ultra-high frequency electric field penetrates into the tissues to a depth of**

- a) up to 1 cm**
- b) 2-3 cm c**
- ) 9-13 cm**
- d) through penetration**
- e) 13-15cm**

**9. Microwave therapy as a therapeutic method is characterized by the use of**

- a) electromagnetic field of the microwave range (ultrahigh frequency)**
- b) electric field**
- c) electromagnetic field of the RF (high frequency) range**
- d) low-frequency alternating magnetic field**
- e) electric current**

**10. To bring electromagnetic microwave radiation to the human body, apply**

- a) capacitor plates**
- b) inductors**
- c) emitters-reflectors**

**d) lead electrodes**

**e) light guides**

**11. Under the action of electromagnetic radiation of the microwave, the main biophysical processes in the tissues of the body are: 1. thermal; 2. mechanical; 3. oscillatory; 4. hydrodynamic; 5. photoelectric**

**a) if the answers 1,2 and Z are correct**

**b) if answers 1 and 3 are correct**

**c) if the answers 2 and 4 are correct**

**d) if the answers are correct 4**

**e) if the answers 1,2,3,4 and 5 are correct**

**12. The therapeutic effect of ultrahigh frequency therapy in inflammatory and dystrophic diseases is due to the action of: 1. anti-inflammatory; 2. vasodilating; 3. analgesic; 4. antispasmodic; 5. desensitizing**

**a) if the answers 1,2 and Z are correct**

**b) if answers 1 and 3 are correct**

**c) if the answers 2 and 4 are correct**

**d) if the answers are correct 4**

**e) if the answers 1,2,3,4 and 5 are correct**

**13. In case of respiratory diseases, the therapeutic effect of ultrahigh frequency therapy is expressed in: 1. improving the function of external respiration; 2. eliminating bronchospasm; 3. reducing the load on the right ventricle; 4. worsening the oxygen transport function of blood; 5. increasing the clotting capacity of blood**

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the answers are correct 4
- e) if the answers 1,2,3,4 and 5 are correct

**14. The methods of EHF therapy include: 1. millimeter therapy; 2. microwave resonance therapy; 3. information wave therapy; 4. decimeter therapy; 5. centimeter therapy**

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the answers are correct 4
- e) if the answers 1,2,3,4 and 5 are correct

**15. The therapeutic effect of EHF therapy is carried out on: 1. the point of pain; 2. biologically active points (BAT); 3. paravertebral; 4. on the zones of Zakharin-Ged; 5. on the area of projection of the adrenal glands**

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the answers are correct 4
- e) if the answers 1,2,3,4 and 5 are correct

Tables, slides.

Cadoscope, slidoscope.

## VI. Chronocard of the training session.

1. Checking the initial level of students' knowledge on this topic, taking into account the information they received in the 3rd year – 30 min.
2. Independent work of students with supervised patients in the hospital department and medical histories – 30 min.
3. Discussion of the topic of the lesson using case histories of supervised patients, educational case histories, sets of tables, drawings, diagrams illustrating the topic - 60 min.
4. Students' analysis of physiotherapy of 1-2 supervised patients, taking into account the topic of the lesson – 60 min.
5. Verification of students' assimilation of the lesson topic (control of the final level of knowledge).

## VII. Independent work of students

1. Curation of patients under the supervision of a teacher in the physiotherapy department
2. Independent appointment of treatment depending on the diagnosis, complications, indications and contraindications to FTL in the supervised patient
3. Work with medical documentation (a list of prescriptions containing data on the area of exposure, duration, technical parameters of the applied method of physiotherapy treatment)
4. Working with literature

## VIII. Literature.

The main recommended literature:

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15. Ponomarenko G. N. Physical treatment: a Handbook. - St. Petersburg, 2002.
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20. Techniques and methods of physiotherapy procedures: Handbook / Edited by V.M. Bogolyubov— - M., 2002.
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- a. Ulashchik B.C. Home physiotherapy. - Mn., 1993.
24. Fadeeva N.I., Maksimov A.I. Fundamentals of physiotherapy in pediatrics: Reference manual. - Nizhny Novgorod, 1997.
25. Chirkin A.A., Bogdanovich L.I., Ulashchik B.C. Ultrasound and reactivity of the body. - Mn., 1977.
26. In the city of ki V.G. Electrotherapy. - M., 1987.

**topic: Phototherapy and ultrasound therapy.**

#### **I. Scientific and methodological justification of the topic.**

**Three factors act on the human body during ultrasound therapy: mechanical, thermal and physico-chemical. They can cause analgesic, antispasmodic, vasodilating, resorbing, anti-inflammatory, desensitizing effects. When they are used in the affected area, blood and lymph circulation is activated, phagocytosis increases, the mechanisms of general and immunological reactivity of the body are activated, the processes of reparative regeneration are accelerated, the functions of the endocrine organs, primarily the adrenal glands, are stimulated. There are hypotensive and broncholytic effects, normalization of respiratory function, improvement of motor, evacuation and absorption functions of the stomach and intestines, increased diuresis. Ultrasound has a depolymerizing and fibrous effect on compacted and sclerosed tissue, and therefore it is successfully used in the treatment of scars, keloids, joint contractures. It increases vascular and epithelial permeability, which served as the basis for the combined use of the factor with medicinal substances and the justification of ultraphonophoresis.**

**Due to the ability of ultrasound to damage the cell membranes of some pathogenic microorganisms, especially leptospir, we can talk about its bactericidal effect.**

**Infrared and visible rays are constantly acting environmental factors that determine the course of vital processes in the body. They have common effects, the main of which is thermal. The absorbed thermal energy accelerates metabolic processes in tissues, activates leukocyte migration, proliferation and differentiation of fibroblasts, which ensures faster healing of wounds and trophic ulcers. Activation of peripheral blood circulation and changes in vascular permeability, along with stimulation of phagocytosis, contribute to the resorption of infiltrates and dehydration of tissues, especially in the subacute and chronic stages of inflammation. Infrared and visible rays with sufficient intensity cause increased sweating, thereby exerting a detoxifying effect. The consequence of the dehydrating effect is a decrease in compression of nerve conductors and a weakening of pain. When exposed to heat rays on reflexogenic zones, there is a decrease in spasm of smooth muscles of internal organs, improvement of blood circulation in them, weakening of pain syndrome, normalization of their functional state. Visible rays of a certain part of the spectrum have the ability to destroy hematoporphyrin, which is part of the bilirubin molecule, which is used in the treatment of newborns with neonatal jaundice. Under the influence of these rays, bilirubin breakdown products are formed, which dissolve well in water and are excreted from the body with urine and bile.**

## **II. The purpose of students' activity in the classroom.**

**The purpose of the lesson: the assimilation of theoretical knowledge of the mechanisms of therapeutic action of phototherapy and ultrasound and the justification of their therapeutic use**

**Tasks: to**

**teach students:**

- to apply phototherapy and ultrasound therapy methods in the complex rehabilitation of patients**
- to justify the choice of FTL taking into account the existing indications and contraindications to the use of photo- and ultrasound therapy**
- the main methodological techniques of phototherapy and ultrasound therapy**

**The student should know:**

- 1. Physical parameters and mechanisms of therapeutic action of ultraviolet, visible and infrared spectrum of electromagnetic radiation. Sources of natural and artificial electromagnetic radiation**
- 2. Techniques and methods of application of various types of phototherapy**
- 3. Indications and contraindications for the appointment of various types of phototherapy**
- 4. Physical parameters, mechanism of therapeutic action and methods of ultrasound application**
- 5. Devices, indications and contraindications for the therapeutic use of ultrasound**

**The student must be able to:**

- 1. Examine the patient using anamnesis data, external examination, physical examination, laboratory and instrumental methods of research**
- 2 Evaluate the changes detected during the examination by various organs and systems**
- 3. Choose the option of phototherapy, ultrasound therapy, taking into account the established diagnosis, indications and contraindications**
- 4. Be able to provide first aid:**
  - for photo burns**
  - with exacerbation of chronic diseases against the background of photo and ultrasound therapy**

### **III. The content of the training.**

**The mechanism of therapeutic action of the UFO, visible and infrared spectrum of electromagnetic radiation. Sources of natural and artificial electromagnetic radiation. Technique and methodology of various types of phototherapy. Indications and contraindications. Physical parameters of phototherapy in childhood. The mechanism of therapeutic action, methods and techniques of ultrasound and drug phonophoresis in childhood. Indications and contraindications.**

### **IV. List of laboratory work, visual aids and TSO tools.**

**Tables, slides.**

### **V. Analysis by case histories.**

#### **IV. Checking the initial and final level of knowledge.**

##### **1. The physical essence of light is**

- a) electromagnetic waves with a wavelength from 0.4 to 0.002 microns**
- b) directional motion of electrically charged particles**
- c) mechanical vibrations of medium particles**
- d) electromagnetic waves with a length of 1 m from 1 mm**
- e) directed ion flow**

##### **2. The depth of penetration into the tissues of electromagnetic waves of the optical range depends more on**

- a) from the power of the luminous flux**
- b) wavelengths**
- c) optical properties of the absorbing medium**
- d) irradiation time**
- e) the type of irradiator**

##### **3. The depth of penetration into the tissues of the incoherent flow of electromagnetic waves of the infrared range is about**

- a) 6 - 8 cm**
- b) 1-2 mm**
- c) up to 1 cm**
- d) 1-2cm**
- e) 2-zcm.**

##### **4. Exposure to infrared radiation on different sites on the same day is incompatible**

- a) with medicinal electrophoresis**
- b) with a light-and-heat bath**
- c) with UHF electric field**
- d) with sinusoidal modulated currents**
- e) with ultrasound**

**5. The depth of penetration of ultraviolet radiation into the tissue is**

- a) up to 2-6 cm**
- b) up  
to  
1 cm**
- c) up to 1 mm**
- d) up to 0.5 mm**
- e) up to 10 cm**

**6. The long-wavelength part of the ultraviolet spectrum mainly absorbs**

- a) mitochondria**
- b) cell protoplasm**
- c) the shell of the cell**
- d) core**
- e) all structures are the same**

**7. It is not typical for ultraviolet erythema**

- a) its appearance during the procedure**
- b) appearance 3-8 hours after irradiation**
- c) dependence on the wavelength of UV radiation**
- d) the presence of clear boundaries**
- e) pigmentation of the irradiation site**

**8. The distance from the skin to the UV irradiation lamp when determining the average biodose should be**

- a) 25 cm**
- b) 10 cm**
- c) 75 cm**
- d) 50 cm**
- e) 1m**

**9. When the distance from the lamp to the human body changes, the biobiose changes**

- a) proportional to the distance**
- b) inversely proportional to the distance**
- c) directly proportional to the square of the distance**
- d) remains unchanged**
- e) inversely proportional to the square of the distance**

**10. The maximum single area of UV irradiation for adults is**

- a) 60-80 cm<sup>2</sup>**
- b) 80 - 100 cm<sup>2</sup>**
- c) 600 cm<sup>2</sup>**
- d) 800 - 1000 cm<sup>2</sup>**
- e) 200 - 250cm<sup>2</sup>**

**11. The flow of light is inherent in all of the above phenomena: 1. diffraction, 2. dispersion, 3. polarization, 4. interference, 5. cavitation**

- a) if the answers 1,2 and 3 are correct**
- b) if answers 1 and 3 are correct**
- c) if the answers 2 and 4 are correct**
- d) if the correct answer is 1,2,3,4**
- d) if the correct answers are 1,2,3,4 and 5**

**12. The reaction occurring in tissues under the influence of broadband infrared radiation of high power is characterized by: 1. by increasing the temperature of the irradiated area, 2. by accelerating physicochemical processes, 3. by accelerating the Brownian motion of molecules, 4. by improving blood supply to tissues, 5. by photosynthesis**

- a) if the answers 1,2 and 3 are correct**
- b) if answers 1 and 3 are correct**
- c) if the answers 2 and 4 are correct**
- d) if the correct answer is 1,2,3,4**

**d) if the correct answers are 1,2,3,4 and 5**

**13. The visible spectrum of radiant energy has an effect on the body: 1. thermal 2. analgesic, 3. metabolic, 4. psychoemotional, 5. hypotensive.**

**a) if the answers 1,2 and Z are correct**

**b) if answers 1 and 3 are correct**

**c) if the answers 2 and 4 are correct**

**d) if the correct answer is 1,2,3,4**

**d) if the correct answers are 1,2,3,4 and 5**

**14. Broadband infrared radiation has a beneficial effect in the treatment of: 1. sluggish wounds, 2. ulcers after burns and frostbite, 3. muscle diseases (post-traumatic contractures), 4. acute appendicitis, 5. erysipelas**

**a) if the answers 1,2 and Z are correct**

**b) if answers 1 and 3 are correct**

**c) if the answers 2 and 4 are correct**

**d) if the correct answer is 1,2,3,4**

**d) if the correct answers are 1,2,3,4 and 5**

**15. When making appointments for local UV irradiation, the prescription indicates: 1. the number of procedures per course, 2. the dose of radiation, 3. the number of fields, 4. the localization of exposure, 5. the density of the power flow**

**a) if the answers 1,2 and Z are correct**

**b) if answers 1 and 3 are correct**

**c) if the answers 2 and 4 are correct**

**d) if the correct answer is 1,2,3,4**

**d) if the correct answers are 1,2,3,4 and 5**

**16. Safety precautions when working with ultraviolet radiation devices provide for all of the above: 1. light-protective glasses, 2. grounding the device, 3. protective "skirt" on the irradiator, 4. checking the average biodose of the lamp, 5. shielding the cabin.**

- a) if the answers 1,2 and 3 are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 1,2,3,4
- d) if the correct answers are 1,2,3,4 and 5

**17. Under the influence of large erythemic doses of ultraviolet radiation: 1. the sensitivity of nerve receptors decreases, 2. inhibitory processes in the central nervous system prevail, 3. blood sugar decreases, 4. vascular wall permeability improves, 5. excitatory processes in the central nervous system prevail**

- a) if the answers 1,2 and 3 are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 1,2,3,4
- d) if the correct answers are 1,2,3,4 and 5

**18. For the treatment of ultraviolet radiation are shown: 1. atherosclerosis, 2. thyrotoxicosis, 3. rickets, 4. melanomatosis, 5. adenomyosis**

- a) if the answers 1,2 and 3 are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 1,2,3,4
- d) if the correct answers are 1,2,3,4 and 5

**19. Under the influence of laser radiation in tissues occurs: 1. activation of the nuclear apparatus of the cell and the DNA - RNA - protein system, 2. increase in the reparative activity of tissues (activation of cell reproduction), 3. increase in the activity of the immune**

system, 4. change in the concentration of ions on semipermeable membranes, 5. improvement of microcirculation

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 1,2,3,4
- d) if the correct answers are 1,2,3,4 and 5

20. Safety regulations when working with lasers provide: 1. a separate office, 2. safety glasses for personnel, 3. supply and exhaust ventilation units, 4. a separate cabin, 5. cabin upholstery with a fabric with a micro-wire

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 1,2,3,4
- d) if the correct answers are 1,2,3,4 and 5

VII. The chronocard of the training session.

1. Control of the initial level of students' knowledge on this topic, taking into account the information they received in the 3rd year – 30 min.
2. Independent work of students with supervised patients in the hospital department and medical histories – 30 min.
3. Discussion of the topic of the lesson using case histories of supervised patients, educational case histories, sets of tables, drawings, diagrams illustrating the topic - 60 min.
4. Analysis of the procedures of 1-2 supervised patients by students, taking into account the topic of the lesson – 60 min.
5. Checking the students' assimilation of the lesson topic – 30 min.

VIII. Independent work of students.

1. Independent appointment of treatment depending on the diagnosis, complications,

indications and contraindications of phototherapy and ultrasound therapy in the supervised patient

2. Curation of patients under the supervision of a teacher in the physiotherapy department

3. Work with medical documentation (a list of prescriptions containing data on the area of exposure, duration, technical parameters of the treatment method used)

4. Work with literature

#### IX. Literature.

The main recommended literature:

1. Bogolyubov V.M., Ponomarenko G.N. General physiotherapy. Textbook.- Moscow. Medicine - 2003 - 430 p.

2. Ponomarenko G.N. General physiotherapy. Textbook. M. GEOTAT - Media, 2012. - 368s.

Additional recommended literature:

1. Vorobyov M.G., Vorobyov V.M. Physiotherapy at home. - St. Petersburg, 1992.

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8. Karandashov, V. I., Petukhov, E. B., Zrodnikov B. C. Phototherapy: a Manual for doctors /Under the editorship of N. R. Pale-WA.— M., 2001.

9. Klyachkin, L. M., A. M. Shevaykov Medical rehabilitation of patients with diseases of internal organs: a Guide for physicians. — M., 2000.

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topic: Heat treatment and hydrotherapy

#### I. Scientific and methodological justification of the topic.

The thermal factor occupies a leading place in the mechanism of action. It causes an increase in local temperature and active hyperemia of the skin, revives capillary blood flow, improves regional hemodynamics and metabolic processes, has an antispasmodic effect, increases sweating, increases the tone of the parasympathetic part of the autonomic nervous system, promotes the resorption of inflammatory infiltrates, scars and adhesions, has an analgesic effect, stimulates regenerative processes. Paraffin and, to a lesser extent, ozokerite, when cooled, decrease in volume (up to 15%) and can have a gentle compression effect with circular applications. Due to this, a deeper warming of the tissues and a change in vascular tone is achieved, which leads to a decrease in the phenomena of bleeding and exudation. The excitation of skin mechanoreceptors is also one of the reasons for the formation of segmental reflex reactions in internal organs.

Hydrotherapy is the use of water for the treatment, prevention and rehabilitation of patients. It includes two separate sections: hydrotherapy and balneotherapy. Indications for hydrotherapy are very broad and are largely determined by the type of hydrotherapy procedure. The basis of the effect of hydrotherapeutic procedures on the body is a combination of various thermal and mechanical stimuli, mutually conditioning and complementary to each other. They

have been used by humans since ancient times and are a proven method of treating and preventing many diseases, as well as a means of training and hardening the body.

#### I. The purpose of students' activity in the classroom.

1. The purpose of the lesson: the assimilation of theoretical knowledge of the therapeutic effect of heat treatment and hydrotherapy and the justification of their practical application

2. Tasks: to

teach students:

-to justify the choice of methods of heat treatment and hydrotherapy, taking into account the mechanism of their therapeutic effect, existing indications and contraindications to use

-apply methods of heat treatment and hydrotherapy in the complex rehabilitation of patients

-the main methods of safe thermal and hydrotherapy procedures

The student should know:

1. The concept of heat capacity and thermal conductivity of physical media. Biophysical and physiological reactions underlying the therapeutic effect of thermal and hydrotherapy

2. Features of vascular reactions from internal organs and skin under the influence of hydrotherapy procedures of different temperatures

3. Indications and contraindications for the appointment of "cool" and "warm" hydrotherapy procedures

4. Mechanisms of therapeutic effect of mud and paraffin-ozokerite applications on biological tissues

5. Methods of application of mud, paraffin and ozokeritotherapy

The student must be able to:

1. Be able to examine the patient using anamnesis data, external examination, physical examination, laboratory and instrumental methods

2. Be able to evaluate the changes detected during the examination of the patient from various organs and systems, to justify the nosological diagnosis
3. Be able to justify the choice of the method of heat treatment and hydrotherapy, taking into account the established diagnosis, the mechanism of action of treatment.
4. Be able to provide first aid in acute and urgent conditions:
  - with exacerbation of chronic diseases on the background of heat and hydrotherapy
  - in case of hypothermia and overheating

### III. The content of the training.

Familiarization of students with the mechanism of action of therapeutic mud and other heat carriers. The concept of heat capacity and thermal conductivity of physical media. Biophysical and physiological reactions underlying thermal and hydrotherapy. Types of peloid and balneotherapy. Classification of peloids and mineral waters. Local natural physical factors. Indications and contraindications. Methodology and technique of procedures. Age parameters, temperature regime. Combination with other physical factors.

### IV. A list of laboratory works, visual aids and TSO tools.

Tables, slides

### V. Analysis by case histories

### VI. Checking the initial and final level of knowledge.

1. A cold hydrotherapy procedure is a shared bath at water temperature:
  - a) 20° C
  - b) 22° C
  - c) 24° C
  - d) 26° C
  - e) 28° C

2. The maximum pressure of the jet of water supplied to the patient during an underwater shower massage can be

- a) 2 atm
- b) 3 atm c
- ) 4 atm
- d) 5 atm
- d) 6 atm

3. The duodenal action of mineral water is called:

- a) relaxing effect on the walls of the stomach
- b) stimulating effect on gastric secretion
- c) suppression of gastric secretion
- d) stimulation of the motor function of the gastrointestinal tract; opening of the gatekeeper

4. The pyloric effect of mineral water is called:

- a) relaxing effect on the walls of the stomach
- b) stimulating effect on gastric secretion
- c) suppression of gastric secretion
- d) stimulation of the motor function of the gastrointestinal tract
- e) disclosure of the gatekeeper

5. Through the intact skin from the bath water, the following enter the body: 1. sodium; 2. iodine; 3. arsenic; 4. sulfides; 5. carbon dioxide

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

6. Immobile souls include the following: 1. Charcot shower; 2. ascending; 3. Scottish; 4. circular; 5. fan

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

7. The following ingredients are necessary for the artificial preparation of an iodomic bath: 1. sodium iodide; 2. potassium bromide; 3. table salt; 4. distilled water; 5. hydrochloric acid.

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

8. Hydrogen sulfide baths are indicated for the following diseases: 1. polyarthrititis of non-tuberculous origin; 2. polyneuritis in the subacute stage; 3. atherosclerosis of peripheral arteries; 4. psoriasis; 5. hypertension stage 1-2A

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

9. Radon baths are indicated for the following diseases: 1. intervertebral osteochondrosis; 2. polyneuritis in the subacute stage; 3. atherosclerosis of peripheral vessels; 4. hypertension 1-2 stages; 5. thyrotoxicosis (mild form).

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

10. Carbon dioxide baths have the following effects on the respiratory system: 1. increased activity of the respiratory center; 2. reduction of respiratory rate; 3. broncholytic effect; 4. reduction of respiratory volume; 5. increase in minute volume of breathing

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

11. Carbon dioxide baths are indicated for the following diseases: 1. mitral valve insufficiency; 2. osteoarthritis; 3. hypertension 1-2 A st; 4. cerebral atherosclerosis above stage 2; 5. polio.

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

12. Sodium chloride baths are indicated for the following diseases: 1. osteoarthritis; 2. polyneuritis in the subacute stage; 3. chronic salpingoophoritis; 4. hyperthyroidism; 5. chronic ischemic heart disease 3 functional class

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct

- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

13. Iodromic baths are indicated for the following diseases: 1. atherosclerotic cardiosclerosis without angina and cardiac rhythm and conduction disorders; 2. hypersthenic neurasthenia; 3. neuritis in the subacute stage; 4. ovarian dysfunction; 5. scaly lichen

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

14. Taking mineral water with a temperature of 40-45 ° C, mineralization of 1.5-Zg / l, 3-4 times a day 40 minutes before meals slowly, in small sips is indicated for the following diseases: 1. chronic colitis with increased motor activity; 2. chronic pancreatitis; 3. intestinal dyskinesia with increased motor activity; 4. chronic gastritis with normal secretion; 5. chronic pyelonephritis.

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

15. Drinking mineral waters are prescribed for the following diseases: 1. peptic ulcer of the stomach and duodenum outside the acute phase; 2. urolithiasis; 3. obesity; 4. viral hepatitis; 5. ulcerative colitis.

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct

- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

16. The following types of exposure are compatible with sodium chloride baths in one day: 1. UHF electric field on the joint; 2. electroson; 3. ultrasound therapy on the tonsils; 4. underwater shower massage; 5. mud application "trousers".

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

17. The following diseases are indications for the purpose of intestinal flushing (irrigation): 1. ulcerative colitis; 2. chronic colitis; 3. inguinal hernias; 4. obesity; 5. chronic appendicitis

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

18. Combined application of physical factors is:

- a) simultaneous application of several physical factors to the same area of the body;
- b) consistent application of therapeutic factors to the same or different areas of the body.

19. In assessing the physical properties of heat carriers, the following are important:

- 1. heat capacity;

2. thermal conductivity; 3. lack of convection; 4. electrical conductivity; 5. tissue density

- a) if the answers 1,2 and Z are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

#### VII. The chronocard of the training session.

1. Checking the initial level of students' knowledge on this topic, taking into account the information they received in the 3rd year – 30 min.
2. Independent work of students with supervised patients in the hospital department and medical histories – 30 min.
3. Discussion of the topic of the lesson using case histories of supervised patients, educational case histories, sets of tables, drawings, diagrams illustrating the topic - 60 min.
4. Analysis of the procedures of 1-2 supervised patients by students, taking into account the topic of the lesson – 60 min.
5. Verification of students' assimilation of the lesson topic (control of the final level of knowledge) - 30 min.

#### VIII. Independent work of students.

1. Curation of patients under the supervision of a teacher in hospital departments
2. Independent appointment of treatment depending on the diagnosis of the supervised patient, possible complications, indications and contraindications to FTL
3. Work with medical documentation (a list of prescriptions containing data on the area of exposure, duration, technical parameters of the treatment method used)
4. Working with literature

## IX. Literature.

The main recommended literature:

1. Bogolyubov V.M., Ponomarenko G.N. General physiotherapy. Textbook.- Moscow. Medicine - 2003 - 430 p.
2. Ponomarenko G.N. General physiotherapy. Textbook. M. GEOTAT - Media, 2012. - 368s.

Additional recommended literature:

1. Boksha V.G. The problem of adaptation and spa treatment— - M., 1989.
2. Weisfeld D.N., Golub T.D. Therapeutic use of mud. - Kiev, 1980.
3. The magic power of water: A collection / Comp. L.M. Popova, I.V. Sokolov. - St. Petersburg, 1994.
4. Vorobyov M.G., Parfenov AL. Physiotherapy and balneology— - L., 1982.
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**topic: Spa treatment.**

## **I. Scientific and methodological justification of the topic.**

**Sanatorium treatment occupies a special place in the complex of therapeutic, rehabilitation and preventive measures aimed at strengthening human health. Based on the extensive use of natural healing factors, it has long and deservedly enjoyed great popularity.**

## **II. The purpose of students' activity in the classroom.**

**The purpose of the lesson: mastering theoretical knowledge on the selection and referral of patients for sanatorium treatment**

**Tasks: to**

**teach students:**

**-a reasonable referral to the sanatorium-resort treatment of therapeutic patients, taking into account the existing diseases, existing indications and contraindications**

**-differentiated application in the complex rehabilitation of patients with various types of spa treatment**

**The student should know:**

- 1. Types of spa treatment. Mechanisms of biological and therapeutic effects of balneological and climatic factors**
- 2. Features of the use of drinking mineral waters in various diseases of the digestive system**
- 3. Principles of selection of patients for spa treatment: indications and contraindications for referral to sanatorium treatment**

**The student must be able to:**

- 1. Conduct an examination of the patient: anamnesis collection, external examination, physical examination.**
- 2. Be able to substantiate the diagnosis, the phases of the course of the disease and the prognosis for recovery, using the changes detected during the examination of the patient from various organs and systems, anamnestic and instrumental data.**
- 3. Be able to choose the type of spa treatment taking into account the therapeutic effect of balneological factors, the patient's diagnosis, indications and contraindications to spa treatment.**
- 4. Know the basic principles of medical documentation for referral of patients to sanatorium treatment**

### **III. The content of the training.**

**Types of spa treatment. Mechanisms of biological and therapeutic effects of balneological and climatic factors. Features of the use of drinking mineral waters in diseases of internal organs. Balneotherapy for diseases of the musculoskeletal system in children. Indications and contraindications to spa treatment. Principles of selection of patients for sanatorium treatment.**

### **IV. List of laboratory work, visual aids and TSO tools.**

**Tables, slides**

### **V. Analysis of pharmacotherapy of hypertension according to medical histories.**

### **VI. Checking the initial and final level of knowledge.**

**1. Air baths at an equivalent effective temperature of 17-20 ° C are called:**

- a) cold
- b) moderately cold
- c) cool
- d) indifferent
- e) warm

**2. Sunbathing is carried out at a radiation-equivalent-effective temperature equal to:**

- a) 1-10 ° C
- b) 11-16 °C
- c) 17-30 °C
- d) 31-35 °C
- e) 36-39 °C

**3. Climate therapy includes the following effects: 1. aerotherapy; 2. heliotherapy; 3. thalassotherapy; 4. phytotherapy; 5. aromatherapy.**

- a) if the answers 1,2 and 3 are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is 4
- e) if the answers 1,2,3,4 and 5 are correct

**4. Balneological resorts are divided as follows: 1. with waters for external use; 2. with waters for internal use; 3. climatobalneological; 4. balneogryazevy; 5. balneoclimatic.**

- a) if the answers 1,2 and 3 are correct
- b) if answers 1 and 3 are correct
- c) if the answers 2 and 4 are correct
- d) if the correct answer is