MINISTRY OF HEALTH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

Department of Occupational Diseases and Functional Diagnostics and Phthisiopulmonology

International faculty

Syllabus course of elective discipline

Fundamentals of Ultrasound Doppler diagnostics

Volume	Total ECTS hours 90/ credits 3 (practical lessons 30 hours, independent work 60 hours)
Semester, year of study	6 year applicants of higher education, semesters XI- XII
Days, time, place	According to the approved schedule of classes of the Department of Occupational Diseases and Functional Diagnostics and Phthisiopulmonology.
Teacher (s):	MD, Prof. Ignatiev O.M., PhD from Medicine, assistent Volianska V.S.
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Workplace	Department of Occupational Diseases and Functional Diagnostics, Therapeutic Department of Odessa Regional Clinical Medical Center, Odessa, Sudnobudivna str., 1
Consultations	Consultations: face-to-face Wednesdays 13.00-14.00 Online: Tuesday, Thursday 13.00-14.00

COMMUNICATION

Communication with students of higher education will be carried out through face-to-face meetings and the use of the social network Microsoft Teams, Skype, Zoom, Telegram, WhatsApp, in the classroom according to the schedule.

Language of education: English

COURSE ANNOTATION

The subject of study of the discipline - is ultrasound diagnostics (which includes consideration of issues of ultrasound anatomy and methodology of ultrasound examination of brain vessels, criteria for the main lesions of extracranial arteries, transcranial ultrasound examination of cerebral vessels, pathology of the venous system of the brain, ultrasound assessment of the results of reconstructive and endovascular interventions) and basic, basic knowledge of physics (Doppler effect, velocity characteristics of blood flow, resistance of the vascular wall, etc.), necessary for the professional activity in the specialty: "Medicine"

Prerequisites

The basis for mastering the discipline is the knowledge, skills and abilities acquired during the study of such disciplines as Ukrainian language (for professional fields), foreign language (for professional fields), anatomy, physiology, histology, microbiology, virology and immunology, pathophysiology, pathomorphology, radiology, pharmacology, propaedeutics of internal medicine, propaedeutics of pediatrics, radiology, hygiene and ecology, phthisiology.

Postrequisites

Involves the study of relationships with the following disciplines: internal medicine, phthisiology, infectious diseases, otorhinolaryngology, epidemiology, neurology, dermatology, occupational diseases, oncology, clinical pharmacology, traumatology and orthopedics, allergology, emergency and urgent medical care, radiation medicine.

The purpose of the course: the study of ultrasound diagnostics of diseases of the vessels of the brain and neck is the acquisition of theoretical knowledge and practical skills by each applicant of higher education regarding the main disorders in the hemodynamics of the vessels of the head and neck, the interpretation of the results of ultrasound examination, the justification of the rational and safe for human health use of functional tests.

Tasks of the discipline:

1) to acquire in-depth knowledge of ultrasound diagnostics and related specialties;
2) to study in depth the physical characteristics of the main components of dopplerography of vessels and their interpretation in case of some changes in vessels;
3) to acquire the skills of assessing stenoses in the carotid basin using various techniques for further patient management tactics;
4) study in depth the indications for the use of provocative drugs (when conducting pharmacological tests) in accordance with the knowledge of pharmacodynamics, the

adequate dosage form, ways of administration and interactions with other drugs and the patient's condition at the time of the examination;
5) to gain in-depth knowledge of possible side effects of ultrasound itself (especially during long-term scanning of the fundus, pregnant women) and methods of their prevention;
6) mastering the technique of the transtemporal method of ultrasound examination of cerebral vessels;
7) practicing the skills and abilities of analyzing the results of return tests, hypercapnia test, collateral blood circulation reserve;.
8) acquisition of skills in the use of modern information technologies when teaching elective discipline "Fundamentals of Ultrasound Doppler diagnostics ".

Expected results

As a result of studying the discipline the applicant of higher education should **know:**
• Physical foundations of obtaining the Doppler spectrum;
• main characteristics of the Doppler spectrum;
• the dependence of the determined velocity of the blood flow on the angle between the ultrasonic beams and the direction of the blood flow in the vessel;
• spectrum of Doppler methods;
• formation of color Doppler mapping;
• advantages and disadvantages of different modes of dopplerography;
• main characteristics of the Doppler spectrum;
• artifacts during the Doppler study;
• indications for ultrasound of the brachiocephalic arteries;
• criteria for the main diseases of cerebral vessels;
• ultrasound anatomy of brachiocephalic arteries;
• characteristics of the unchanged spectrum of blood flow in brachiocephalic arteries;
• classification of atherosclerotic plaques;
• criteria of subclavian steal
• levels of cerebral collateral blood circulation;
be able:
• choose an ultrasonic sensor frequency adequate to the research task;
• evaluate the echogenicity and structure of atherosclerotic plaques;
• detect ultrasound image artifacts;
• choose a dopplerography mode adequate to the research task;
• detect distortion of the Doppler spectrum;
• perform angle correction during spectral examination of the vessel;
• determine the degree of flow turbulence;
• assess the degree of blood flow resistance in the vessel;
• to determine the presence of arterial stenosis and its degree on the ultrasound picture;
• assess the state of the vascular wall;
• evaluate the data of compression tests;
• determine ultrasound criteria of stenoses of various degrees;

• differentiate the main extracranial vessels;
• determine the pathological tortuosity of vessels and its shape;
• determine indications for transcranial examination of brain vessels;
• choose an ultrasound approach for the study of cerebral vessels;
• evaluate the effectiveness of collateral circulation.

COURSE DESCRIPTION

Forms and methods of education

The course will be taught in the form of practical lessons (30 hours) and independent work (60 hours).

1) Practical lessons (oral and written interviews, solving test tasks, solving situational problems, working with setting up the ultrasound machine and further sonication of blood vessels are provided). The teacher uses interactive teaching methods.

2) Independent work in the study of a elective academic discipline is ensured by methodical developments for independent work, visual teaching aids (video, presentations), information resources of the department, topics of independent work, structured algorithms of skill control.

Control methods:

- entrance and final knowledge level control tests on the topic of practical training;
- oral answer to questions based on the material of the current topic;
- solving typical and atypical clinical situational problems;
- control of practical skills on an ultrasound machine;
- balance

The study of the discipline is implemented on the basis of the following teaching methods:

- according to the dominant teaching methods (verbal, visual);
- blitz survey;
- solving creative problems;
- drawing up graphic schemes;
- group discussions on problem situations;
- performing manual tasks on the ultrasound machine;
- individual control interview;
- logical exercises;
- business games;
- situational tasks;
- performance of individual studies;
- problematic teaching method;
- "brain storm"

Course content

Topic 1. Physical foundations of dopplerography
Topic 2. Physiological aspects of hemodynamics
Topic 3. Duplex (triplex) scanning

Topic 4. Peculiarities of dopplerography of vessels with high and low peripheral resistance. Indices of vascular resistance.

Topic 5. Ultrasound anatomy of vessels of the head and neck

Topic 6. Methods of research of vessels of the neck

Topic 7. Ultrasound anatomy of main intracranial arteries and veins of the head. Technology of transcranial duplex scanning of intracranial vessels of the head.

Topic 8. Functional tests. Cerebrovascular reactivity

Topic 9. Ultrasound data of the main vascular lesions

Topic 10. Ultrasound diagnosis of extra- and intracerebral vascular pathologies

Topic 11. Duplex study of the abdominal aorta and its visceral branches.

Topic 12. Ultrasound diagnosis by duplex scanning of vessels of the upper and lower extremities.

List of recommended literature

Main:

1. Neurosonology and neuroimaging of stroke har/dvd edition by José Valdueza M., Schreiber S., Röhl J.-E., Klingebiel R. Thieme; 2nd edition (14 dec. 2016), 630 p.
2. Vinke E.J., Kortenbout A.J., Eyding J., Slump C.H., van der Hoeven J.G., de Korte C.L., Hoedemaekers C.W. Potential of Contrast-Enhanced Ultrasound as a Bedside Monitoring Technique in Cerebral Perfusion: A Systematic Review. Ultrasound Med. Biol. 2017; 43:2751–2757. doi: 10.1016/j.ultrasmedbio.2017.08.935.
3. Naritaka H., Ishikawa M., Terao S., Kojima A., Kagami H., Inaba M., Kato S. Ultrasonographic Superb Microvascular Imaging for Emergency Surgery of Intracerebral Hemorrhage. J. Clin. Neurosci. 2020;75:206–209. doi: 10.1016/j.jocn.2020.03.002.
4. Ultrasound detection of cerebral microembolism in carotid stenoses: achievements and prospects (literature review) M.V. Globa Endovascular neuroradiological surgery - 2020. - No. 1(31). - P. 56-67 https://doi.org/10.26683/2304-9359-2020-1(31)-56-67
5. Assessment of cerebral blood flow in patients with vertebrobasilar insufficiency according to the presence of structural changes in the posterior circulation system / M.V. Globa, L.M. Sulii, V.V. Vashchenko, T.G. Novikova // Collection. scientific works of employees of the P. L. Shupyk N MAPE. - 2018. - Release. 30. - pp. 557-566.
6. Welkoborsky H.-J., Jecker P., Maurer J., Mann W.J. Ultraschalldiagnostik Kopf-Hals. Thieme, 2018. 160 p.
7. Clinical Doppler Ultrasound: Expert Consult: Online and Print 3rd Edition by Myron A. Pozniak MD, Paul L Allan BSc MBChB DMRD FRCR FRCPE 2013) Churchill Livingstone; 3rd edition 400 p.

8. Widder B., Hamann G.F. Duplexsonographie der hirnversorgenden Arterien. Springer Berlin, Heidelberg, 2018. 336 p.
9. Pellerito J., Polak J.F. Introduction to Vascular Ultrasonography, 7th Ed. Elsevier, 2020, 882 p.
10. https://info.odmu.edu.ua/chair/occupational diseases and functional diagnostics /files/en

EVALUATION

Forms and methods of current control: oral control, survey, practical, test, self-control, etc.

Current assessment criteria at the practical lesson

Grade	Evaluation criteria
«5»	The applicant has a fluent command of the material, takes an active part in discussing and solving a situational clinical problem, confidently demonstrates knowledge during the interpretation of laboratory research data, expresses his opinion on the subject of the lesson, demonstrates clinical thinking.
«4»	The applicant has a good command of the material, participates in the discussion and solution of a situational clinical problem, makes some mistakes during the interpretation of laboratory research data, expresses his opinion on the subject of the lesson, demonstrates clinical thinking.
«3»	The applicant does not have sufficient knowledge of the material, is unsure of participating in the discussion and solution of the situational clinical problem, makes significant mistakes during the interpretation of laboratory research data.
«2»	The applicant does not have a good command of the material, does not participate in the discussion and solution of the situational clinical problem, in the interpretation of laboratory research data.

Forms and methods of final control: credit test, issued to the applicant who has completed all sections of the educational program of the selected discipline, actively participated in practical classes, has an average current grade of at least 3.0 and has no academic debt.

Conditions for obtaining additional (bonus) points. Possibility and conditions of obtaining additional (bonus) points: not provided.

Independent work. The evaluation of the independent work of the applicants of higher education, which is provided for in the topic along with the classroom work,

is carried out during the current control of the topic in the corresponding classroom session, as well as at the final control.

EDUCATIONAL DISCIPLINE POLICY

Deadlines and Rescheduling Policy:

• absences from classes due to non-respectable reasons are made up according to the schedule of the teacher on duty.

• absences due to valid reasons are worked out according to an individual schedule with the permission of the dean's office.

Academic Integrity Policy: Applicants must observe academic integrity, namely:

• independent performance of all types of work, tasks, forms of control provided for by the work program of this educational discipline;

• references to sources of information in the case of using ideas, developments, statements, information;

• compliance with the legislation on copyright and related rights;

• provision of reliable information about the results of one's own educational (scientific) activity, used research methods and sources of information.

Unacceptable in educational activities for participants of the educational process are:

• using family or official ties to obtain a positive or higher grade during any form of control of learning outcomes or academic performance;

• use of prohibited auxiliary materials or technical means (cheat sheets, notes, micro-earphones, telephones, smartphones, tablets, etc.) during control measures;

• passing procedures for control of training results by fake persons.

For violation of academic integrity, applicants of higher education may be held to the following academic responsibility:

Attendance and Tardiness Policy Uniform: medical gown, cap, protective mask, change of footwear.

Equipment: notebook, pen.

State of health: applicants, who suffering from acute infectious diseases, including respiratory diseases, are not allowed to attend classes.

The applicant who is late for class can attend it, but if the teacher has put "nb" in the journal, he must complete it in the general order. Online classes at the department are conducted using the Ms Teams distance learning system. Each applicant must

connect to the webinar room in a timely manner. Online classes include on-screen and oral demonstrations of learning materials, dialogue between the teacher and applicants.

Use of mobile devices. Copying, use of various software tools, hints, use of a mobile phone, tablet or other electronic gadgets during class are not allowed. Mobile devices may be used by applicants with the permission of the teacher if they are needed for the assignment.

Behavior in the audience The behavior of applicants and teachers in the classrooms must be working and calm, strictly comply with the rules established by the Regulations on academic integrity and ethics of academic relations at Odessa National Medical University, in accordance with the Code of Academic Ethics and University Community Relations of Odessa National Medical University, Regulations on Prevention and detection of academic plagiarism in the research and educational work of applicants of higher education, scientists and teachers of Odessa National Medical University.