

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
ОДЕСЬКИЙ НАЦІОНАЛЬНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ

Кафедра сімейної медицини та поліклінічної терапії

ЗАТВЕРДЖУЮ

Проректор з науково-педагогічної роботи

Едуард БУРЯЧКІВСЬКИЙ

01 вересня 2024 року

**РОБОЧА ПРОГРАМА З ДИСЦИПЛІНИ
«ЕКСПРЕС АНАЛІЗ ЕКГ»**

Рівень вищої освіти: другий (магістерський)

Галузь знань: 22 «Охорона здоров'я»

Спеціальність: 222 «Медицина»

Освітньо-професійна програма: Медицина

Робоча програма складена на основі освітньо-професійної програми «Медицина» підготовки фахівців другого (магістерського) рівня вищої освіти зі спеціальності 222 «Медицина» галузі знань 22 «Охорона здоров'я», ухваленою Вченою Радою ОНМедУ (протокол № 10 від 27 червня 2024 року).

Розробники:

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 доцент кафедри, PhD Д. Лагода
 доцент кафедри, PhD Я. Бажора
 асистент кафедри В. Назарян

Робоча програма затверджена на засіданні кафедри сімейної медицини та поліклінічної терапії
 Протокол № 1 від 29.08.2024р.

Завідувачка кафедри

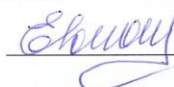
 Валентина ВЕЛИЧКО

Погоджено із гарантом ОПП

 Валерія МАРІЧЕРЕДА

Схвалено предметною цикловою методичною комісією з терапевтичних дисциплін ОНМедУ
 Протокол № 1 від 30.08.2024 р.

Голова предметної циклової методичної комісії з терапевтичних дисциплін ОНМедУ

 Олена ВОЛОШИНА

Переглянуто та затверджено на засіданні кафедри сімейної медицини, загальної практики та поліклінічної терапії

Протокол № 1 від "05" вересня 2024 р.

Завідувач кафедри

 Валентина Величко

Переглянуто та затверджено на засіданні кафедри _____

Протокол № ___ від "___" _____ 20__ р.

Завідувач кафедри _____

1. Description of the discipline:

Name of indicators	Field of knowledge, specialty, specialization, level of higher education	Characteristics of the discipline
Total number: Credits of ECTS: 3,0 Hours: 90 Content modules: 3	Field of knowledge 22 «Health care» Specialty 222 «Medicine» Level of higher education second (master's degree)	<i>Full-time (day) education</i> <i>Elective course</i>
		<i>Course: 6</i>
		<i>Semester: XI - XII</i>
		<i>Lectures (0 hours)</i>
		<i>Seminars (0 hours)</i>
		<i>Practical classes (30 hours)</i>
		<i>Laboratories (0 hours)</i>
		<i>Independent work (60 hours)</i>
		<i>including individual tasks (0 hours)</i>
		<i>Form of final control – Credit Test</i>

2. The purpose and tasks of the educational discipline, competencies, program learning outcomes

Purpose: deepening, expansion and concretization by the student of higher education of knowledge and formation of elements of professional competences in the instrumental diagnostics, namely electrocardiography, in healthy population and in cardiovascular or extracardiac pathology, formation of the ability to interpret the ECG, improvement of skills and competences acquired during the study of the course, as well as verification of effectiveness and quality their assimilation.

The tasks of the discipline are the following:

1. Specification of knowledge regarding the electrocardiogram evaluation algorithm.
2. Deepening of knowledge regarding the identification of variants of a normal ECG and pathological changes on the ECG in various pathologies.
3. Acquiring the skills of timely detection of potentially dangerous changes on the ECG in order to prevent the occurrence of a complicated course of certain pathologies.
4. Deepening of knowledge and improvement of skills regarding ECG diagnosis of emergency conditions and determination of emergency aid tactics.
5. Improving the skills of substantiation of clinical diagnosis, differential diagnosis, further management tactics of patients with the most common diseases of the cardiovascular system using the electrocardiographic research method.
6. Consolidation of knowledge about writing an ECG conclusion.

The process of studying the discipline is aimed at forming elements of following competencies:

General competencies (GC):

- GC 1. Ability to abstract thinking, analysis, and synthesis.
- GC 3. Ability to apply knowledge in practical situations
- GC 4. Knowledge and understanding of the subject area and understanding of professional activity
- GC 5. Ability to adapt and act in a new situation.
- GC 6. Ability to make reasonable decisions
- GC 7. Ability to work in a team

- GC 8. Ability to interpersonal interaction
- GC 11. Ability to search, process and analyze information from various sources
- GC 12. Determination and persistence in relation to assigned tasks and assumed responsibilities
- GC 13. Awareness of equal opportunities and gender issues.
- GC 16. Ability to evaluate and ensure the quality of the work performed

Special competencies (SC):

- SC1 – Ability to collect medical information about the patient and analyze clinical data.
- SC2 – Ability to determine the list of laboratory and instrumental studies and evaluate their results.
- SC3 – Ability to establish a preliminary and clinical diagnosis of the disease.
- SC6 – Ability to determine the principles and nature of treatment and prevention of diseases.
- SC7 – Ability to diagnose emergency conditions.
- SC8 – Ability to determine tactics and provide emergency medical help.
- SC16 – Ability to maintain medical documentation, including electronic forms.
- SC26 – The ability to determine the management tactics of persons subject to dispensary supervision.

Program learning outcomes (PLO):

- PLO 1. Having a thorough knowledge of the structure of professional activity. Being able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy.
- PLO 2. Understanding and knowledge of fundamental and clinical biomedical sciences, at a level sufficient for solving professional tasks in health care.
- PLO 3. Specialized conceptual knowledge that includes scientific achievements in the field of health care and is the basis for conducting research, critical understanding of problems in the field of medicine and related interdisciplinary problems, including an early intervention system.
- PLO 4. Identify and identify leading clinical symptoms and syndromes (according to list 1); according to standard methods, using preliminary data of the patient's history, data of the patient's examination, knowledge about the person, his organs, and systems, establish a preliminary clinical diagnosis of the disease (according to list 2).
- PLO 5. Collect complaints, life anamnesis, and diseases, assess the psychomotor and physical development of the patient, the state of organs and systems of the body, based on the results of laboratory and instrumental studies, and evaluate information about the diagnosis (according to list 4), considering the age of the patient.
- PLO 6. To establish a final clinical diagnosis by making a reasoned decision and analyzing the received subjective and aim data of clinical, additional examination, carrying out differential diagnosis, observing the relevant ethical and legal norms, under the control of the managing physician in the conditions of a health care institution (according to list 2).
- PLO 7. Prescribe and analyze additional (mandatory and optional) examination methods (laboratory, functional, and/or instrumental) (according to list 4) of patients with diseases of organs and body systems for differential diagnosis of diseases (according to list 2).
- PLO 8. Determine the primary clinical syndrome or symptom that determines the severity of the victim's/victim's condition (according to list 3) by making a reasoned decision about the person's condition under any circumstances (in the conditions of a health care facility, outside its borders), including in conditions of emergency and hostilities, in field conditions, in conditions of lack of information and limited time.
- PLO 10. Determine the necessary mode of work, rest, and nutrition based on the final clinical diagnosis, observing the relevant ethical and legal norms by making a reasoned decision according to existing algorithms and standard schemes.

- PLO 14. Determine tactics and provide emergency medical care in emergency situations (according to list 3) in limited time conditions according to existing clinical protocols and treatment standards.
- PLO 16. Form rational medical routes for patients to organize the interaction with colleagues in their own and other institutions, organizations, and institutions; to apply tools for the promotion of medical services in the market, based on the analysis of the needs of the population, in the conditions of the functioning of the health care institution, its division, in a competitive environment.
- PLO 17. Perform medical manipulations (according to list 5) in the conditions of a medical institution, at home, or at work based on a previous clinical diagnosis and/or indicators of the patient's condition by making a reasoned decision, and observing the relevant ethical and legal norms.
- PLO 21. Searching for the necessary information in the professional literature and databases of other sources, analyzing, evaluating and application of this information.
- PLO 30. Determine the management tactics of persons subject to dispensary supervision.

As a result of studying the discipline, the student of higher education has to

Know:

- electrophysiological basis of electrocardiography
- method of registration of standard ECG and additional leads
- with Participatory ECG evaluation algorithm
- characteristics of ECG elements are normal
- basic calculation formulas for ECG interpretation
- the main signs of acute coronary pathology on the ECG

Be able:

- evaluate the parameters of the electrocardiographic curve
- carry out a clinical evaluation of the ECG according to standard methods
- carry out differential diagnosis and substantiate the clinical diagnosis using ECG data
- determine the tactics of patient management and the provision of emergency medical care, based on the data of ECG diagnostics
- keep medical records
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3. The content of the educational discipline

Content module 1.

Algorithm of electrocardiogram analysis

Topic 1. Physic-technical basics of electrocardiography. ECG - lead.

Clinical significance of the electrocardiography method. Characteristics of the main properties of the heart muscle. The essence and patterns of electrophysiological processes occurring in the myocardium. ECG recording technique. Lead of a standard ECG. Additional ECG leads. The main elements of the ECG.

Topic 2. Normal electrocardiogram. Clinical assessment of ECG parameters.

Determination of the source of excitation and regularity of heart rhythm. Criteria of sinus rhythm. Determination of heart rate. Determination of the position of the electrical axis of the heart, calculation of the alpha angle. Morphological assessment of the main elements of the ECG: norms and deviations from the norm. ECG signs of atrial hypertrophy. ECG signs of ventricular hypertrophy.

Topic 3. 24-hour-ECG monitoring. Indications, clinical significance.

Basics of the "Holter monitoring of ECG" method. Indications and contraindications to the Holter monitoring. Methodological recommendations for Holter ECG monitoring. Electrocardiographic parameters of 24-hour-ECG monitoring.

Content module 2.

ECG assessment of cardiac arrhythmia

Topic 4. ECG features in sinus node disorders (monotopic arrhythmias)

Definition and classification of cardiac arrhythmias. ECG - criteria for sinus tachycardia, sinus bradycardia, sinus arrhythmia, diagnostic value

Topic 5. ECG features in ectopic (heterogeneous rhythm disturbances)

Paroxysmal tachycardia: definition of the concept, classification. ECG signs of various forms of paroxysmal supraventricular tachycardia. Atrial fibrillation and flutter: definitions, forms, ECG signs. Paroxysmal ventricular tachycardia, ventricular fibrillation and flutter: ECG pattern. ECG signs in different variants of extrasystoles.

Topic 6. ECG features in heart conduction disorders

Heart blocks: types, their characteristics. ECG signs of various types of conduction disorders: sinoatrial, atrioventricular, intraventricular blockade. Basic approaches to emergency care and further management of the patient.

Topic 7. ECG-syndromes and ECG-phenomena

Wolf-Parkinson-White syndrome (WPW). Syndrome of shortened P-Q interval. Syndrome of early ventricular repolarization. Syndrome of prolonged Q-T interval: syndrome of weakness of the sinus node. Morgana-Edems-Stokes syndrome. Frederick's syndrome. ECG signs. Basic approaches to emergency care and further management of the patient.

Content module 3.

Electrocardiographic assessment in coronary and non-coronary heart diseases

Topic 8. ECG changes in ischemic heart disease

The main ECG signs of ischemia, damage and necrosis of the myocardium. The conception of "acute coronary syndrome" (ACS). ECG signs in ACS without ST segment elevation and with ST segment elevation. Topical diagnosis of myocardial infarction, use of additional leads. Vasospastic angina pectoris, differential diagnosis.

Topic 9. ECG changes in non-coronary heart diseases (myocarditis, pericarditis, cardiomyopathy)

Peculiarities of ECG signs in pericarditis, clinical significance. Features of ECG signs in myocarditis, clinical significance. Features of ECG signs in cardiomyopathies, clinical significance.

Topic 10. ECG criteria of hypertrophy of heart chambers

Factors of variability of electrocardiographic changes, which are detected in hypertrophy of different parts of the heart. The boundary between the ECG manifestations of left and right atrial hypertrophy. The most reliable ECG signs of hypertrophy of the left and right ventricles.

Topic 11. ECG criteria for electrolyte disturbances

Features of the ECG pattern in hyper- and hypokalemia. Features of the ECG pattern in hyper- and hypocalcemia.

4. The structure of the educational discipline

Themes	Number of hours					
	Total	including				
		lectures	seminars	practical classes	laboratories	Independent work
Content module 1.						
Algorithm of electrocardiogram analysis						
Topic 1. Physic-technical basics of electrocardiography. ECG - lead	6	0	0	2	0	4
Topic 2. Normal electrocardiogram. Clinical assessment of ECG parameters	12	0	0	4	0	8
Topic 3. 24-hour-ECG monitoring. Indications, clinical significance	6	0	0	2	0	4
<i>Total by content module 1</i>	24	0	0	8	0	16
Content module 2.						
ECG assessment of cardiac arrhythmia						
Topic 4. ECG features in sinus node disorders (monotopic arrhythmias)	6	0	0	2	0	4
Topic 5. ECG features in ectopic (heterogeneous rhythm disturbances)	12	0	0	4	0	8
Topic 6. ECG features in heart conduction disorders	12	0	0	4	0	8
Topic 7. ECG-syndromes and ECG-phenomena	6	0	0	2	0	4
<i>Total by content module 2</i>	36	0	0	12	0	24
Content module 3.						
Electrocardiographic assessment in coronary and non-coronary heart diseases						
Topic 8. ECG changes in ischemic heart disease	12	0	0	4	0	8
Topic 9. ECG changes in non-coronary heart	6	0	0	2	0	4

diseases (myocarditis, pericarditis, cardiomyopathy)						
Topic 10. ECG criteria of hypertrophy of heart chambers	6	0	0	2	0	4
Topic 11. ECG criteria for electrolyte disturbances	6	0	0	2	0	4
<i>Total by content module 3</i>	30	0	0	10	0	20
Total hours	90	0	0	30	0	60

5. Themes of lectures / seminars / practical classes / laboratories

5.1. Themes of lectures

Lectures are not provided.

5.2. Themes of seminars

Seminars are not provided.

5.3. Themes of practical classes:

No.	Theme	Hours
1.	Topic 1. Physic-technical basics of electrocardiography. ECG - lead	2
2.	Topic 2. Normal electrocardiogram. Clinical assessment of ECG parameters	4
3.	Topic 3. 24-hour-ECG monitoring. Indications, clinical significance	2
4.	Topic 4. ECG features in sinus node disorders (monotopic arrhythmias)	2
5.	Topic 5. ECG features in ectopic (heterogeneous rhythm disturbances)	4
6.	Topic 6. ECG features in heart conduction disorders	4
7.	Topic 7. ECG-syndromes and ECG-phenomena	2
8.	Topic 8. ECG changes in ischemic heart disease	4
9.	Topic 9. ECG changes in non-coronary heart diseases (myocarditis, pericarditis, cardiomyopathy)	2
10.	Topic 10. ECG criteria of hypertrophy of heart chambers	2
11.	Topic 11. ECG criteria for electrolyte disturbances	2
	Total	30

5.4. Themes of laboratories

Laboratories are not provided.

6. Independent work of the student of higher education

No.	Theme	Hours
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1.	Topic 1. Preparation for practical classes 1-2	8
2.	Topic 2. Preparation for practical classes 3-4	8
3.	Topic 3. Preparation for practical classes 5-6	8
4.	Topic 4. Preparation for practical classes 7-8	8
5.	Topic 5. Preparation for practical classes 9-10	8
6.	Topic 6. Preparation for practical classes 11-12	8
7.	Topic 7. Preparation for practical classes 13-14	8
8.	Topic 8. Preparation for practical lesson 15	4
	Total	60

7. Teaching methods

Practical classes:

- verbal methods: conversation, explanation, discussion, discussion of the acute issues;
- visual methods: illustration (including multimedia presentations);
- practical methods: testing, solving situational tasks (including calculation ones), checking the skills of working with a glucometer.

Independent work:

- independent work with recommended basic and additional literature, with electronic information resources, preparation for seminar classes;
- independent performance of an individual task, preparation of a presentation to defend an individual task.

8. Forms of control and evaluation methods

(including criteria for evaluating learning outcomes)

Ongoing control:

- oral control: individual survey on the theme;
- written control: assessment of the situational task solutions (including calculation), assessment of the performance of an individual task;
- test control: assessment of performance of tests on the theme.

Final control: Credit Test.

Assessment of the ongoing learning activity at the practical classes:

1. Assessment of the theoretical knowledge on the theme:
 - methods: individual survey on the theme, participation of the students in the discussion of problem situations; assessment of performance of tests on the theme;
 - the maximum score – 5, the minimum score – 3, the unsatisfactory score – 2.
2. Assessment of practical skills on the theme:
 - methods: assessment of the solution of situational tasks (including calculation) on the theme;
 - the maximum score – 5, the minimum score – 3, the unsatisfactory score – 2.

Assessment of the individual work:

1. Assessment of the quality of the performance of the individual work:
 - the maximum score – 5, the minimum score – 3, the unsatisfactory score – 2.
2. Assessment of the presentation and defense of an individual work, participation in the assessment of the business plan of the competitors and its critical analysis:
 - the maximum score – 5, the minimum score – 3, the unsatisfactory score – 2.

The score for one practical class is the arithmetic average of all components and can only have an

integer value (5, 4, 3, 2), which is rounded statistically.

Criteria of ongoing assessment at the seminar class

Score	Assessment criterion
Excellent «5»	<p>The student participates actively in the seminar class. He/she demonstrates profound knowledge and provides full and detailed answers. He/she participates actively in discussing problem situations. He/she uses additional educational and methodological and scientific literature. The student knows how to form his attitude to a certain issue and conveys his/her attitude to the issue, gives appropriate examples. He/she knows how to find the most adequate forms of conflict resolution.</p> <p>The tests are completed in full, all 100% of the answers are correct, the answers to the open questions are complete and justified.</p> <p>The student freely solves situational tasks (including calculations), confidently demonstrates practical skills on the theme of seminar class and correctly interprets the data obtained. He/she expresses his own creative opinion on the theme, demonstrates creative thinking.</p>
Good «4»	<p>The student participates in the seminar class. He/she have mastered the material of the seminar class and shows the necessary knowledge, but answers the questions with some mistakes. He/she participates in discussing problem situations. He/she uses the basic educational and methodological and scientific literature. The student expresses his own opinion on the theme of seminar class. The tests are completed in full, not less than 70% of the answers are correct, the answers to the open questions are generally correct, but there are some mistakes in definitions.</p> <p>The student correctly solves situational tasks (including calculations), but admits minor inaccuracies and demonstrates more standardized practical skills on the theme of seminar class with correct interpretation of the received data. He/she expresses his own opinion on the theme, demonstrates creative thinking.</p>
Satisfactory «3»	<p>The student sometimes participates in the seminar class. He/she partially intervenes and asks questions, answers the questions with mistakes. He/she passively works in practical exercises. He/she demonstrates fragmentary knowledge of the conceptual apparatus and literary sources.</p> <p>The tests are completed in full, not less than 50% of the answers are correct, the answers to the open questions are illogical, with obvious significant errors in definitions.</p> <p>The student does not have sufficient knowledge of the material to solve situational problems (including calculations). He/she uncertainly demonstrates practical skills on the theme of seminar class and interprets the data with significant errors, does not express his/her opinion on the topic of the situational problem.</p>
Unsatisfactory «2»	<p>The student does not participate in the seminar class, just observes the learning process. He/she never speaks out or asks a question. He/she is disinterested in the study of the material. The student gives incorrect answers to questions, demonstrates poor knowledge of the conceptual apparatus and literary sources.</p> <p>The test has not been completed.</p> <p>The situation task has not been completed.</p>

Credit Test is considered, if the student has completed all the tasks of the working program of the educational discipline. He/she took actively participated in the practical exercises, and completed an individual work. The student has an average current rating of at least 3.0 and has no academic debt.

9. Distribution of points, obtained by the student of higher education

The average grade in the discipline is converted to the national grade and converted to points on a multi-point scale (200-point scale).

Conversion of traditional assessment into 200-point is carried out by the information and technical department of ONMedU by the special program by the formula:

$$\text{Average score (current academic performance)} \times 40.$$

Conversion table of traditional to multi-point

National score for the discipline	The sum of scores for the discipline
Excellent («5»)	185 – 200
Good («4»)	151 – 184
Satisfactory («3»)	120 – 150
Unsatisfactory («2»)	Less than 120

10. Methodological support

- Working program in the discipline
- Syllabus
- Methodological recommendations for the seminar classes in the discipline
- Methodological recommendations for the individual work of students
- Multimedia presentations
- Situational tasks (including calculation)
- Tests on the theme

11. Questions for the ongoing control

1. What are the main characteristics of the heart muscle that distinguish it from other muscles?
2. Which pacemaker is responsible for sinus rhythm? What heart rate are generated by rhythm drivers of different orders?
3. What are the additional ECG leads and in what cases are they used? How to technically carry out ECG recording in additional leads and how to mark it on the ECG tape?
4. What are the main elements of the electrocardiographic curve; for which processes in the heart is each of them responsible? What elements of an ECG curve can be defined as an isoelectric line?
5. What are the criteria for normal sinus rhythm?
6. Which parameter of the ECG recording is important in determining heart rate? Name the methods of heart rate calculation.
7. Describe the visual methods of determining the direction of the EOS.
8. How does the P wave change with atrial hypertrophy?
9. What changes occur in the activity of the heart when the duration of the PQ segment changes?

10. How does the QRS complex change with ventricular hypertrophy? What are voltage and non-voltage criteria of ventricular hypertrophy?
11. What changes in the ST segment can be noted on the ECG? Violations of which processes reflect changes in the ST segment?
12. What are the characteristics of the T wave in the norm? How can the T wave change and in case of disturbances of which processes?
13. How is the U wave determined on the ECG and what are the normal signs of this wave?
14. Definition and classification of cardiac arrhythmias.
15. Extrasystole: definition, classification, clinical significance.
16. ECG signs of supraventricular extrasystoles.
17. ECG signs of ventricular extrasystoles
18. ECG signs of atrial rhythms.
19. Will the QRS complex always be normal with supraventricular extrasystoles?
20. How does the P wave change depending on the change in the source of excitation in the atria?
21. What are non-paroxysmal ectopic atrial rhythms and what are their ECG features?
22. What conduction pathways exist in the AV node and how does excitation pass through them normally?
23. Define the term "paroxysmal". What are the types of paroxysmal supraventricular tachycardia?
24. What features of the ECG picture can be noted in AV-nodal tachycardia?
25. What are the main ECG signs of atrial fibrillation?
26. What are the forms of atrial flutter? Name the main ECG signs.
27. What major ECG features are more suggestive of ventricular tachycardia than supraventricular tachycardia with aberrant conduction?
28. What are the main ECG signs of torsade de pointes type polymorphic ST?
29. What are the main ECG signs of ventricular flutter and fibrillation? Emergency assistance.
30. What are the main ECG signs of first-degree AV block?
31. What are the main ECG signs of second-degree AV block, Mobitz I?
32. What are the main ECG signs of second-degree AV block, Mobitz II?
33. What are the main ECG signs of III-degree AV block?
34. What degree of CA blockade can be diagnosed using an ECG? What are the main ECG signs?
35. What are the main ECG signs of right bundle branch block and of left bundle branch block?
36. Name the syndromes of premature ventricular excitation and their main ECG signs. What type of supraventricular tachycardia develops in patients with an additional pathway?
37. What are the differences between myocardial ischemia, damage and necrosis?
38. What pathologies are related to acute coronary syndrome? What are the main clinical signs of ACS?
39. Name the main ECG characteristics of acute coronary syndrome without ST segment elevation.
40. Name the main ECG signs in acute myocardial infarction with ST segment elevation.
41. Describe the evolution of changes in the ECG pattern in acute myocardial infarction with ST segment elevation.
42. In which leads will changes be noted in case of anterolateral localization of a myocardial infarction?
43. In which leads will changes be noted when a myocardial infarction is localized in the right ventricle?
44. In which leads will changes be noted when the myocardial infarction is localized in the lower parts of the heart?
45. Define vasospastic angina and describe the changes on the ECG.
46. What elements of the ECG curve reflect the processes of ventricular repolarization? Name the main ECG signs of early ventricular repolarization syndrome that distinguish it from pericarditis.

47. What QTc values indicate long and short QT syndrome?
48. What are the main causes of long QT syndrome?
49. What type of tachycardia can develop in long QT syndrome and what are its possible consequences?
50. What changes on the ECG are characteristic of Brugada syndrome?
51. List the ECG signs of pericarditis.
52. In which electrolyte disorders is the prolongation of the QT interval noted on the ECG?
53. In which electrolyte disorders can inversion of the T wave be noted on the ECG?
54. In which electrolyte disorders can high pointed T-waves be noted?
55. What electrolyte disorders can lead to a delay in the conduction of excitation from the atria to the ventricles?
56. In which electrolyte disturbances is the shift of the ST segment relative to the isoline noted?
57. What ECG signs characterize the Mc-Jean-White syndrome?

12. Recommended literature

Basic:

1. The ECG. Made easy. Ninth edition / John Hampton, Joanna Hampton. Elsevier, 2019. 207 pages.
2. The ECG Made Practical / John Hampton, David Adlam – Elsevier, 2019. 341 pages.
3. Family Medicine: in 3 books. Book 3. Special Part. Multidisciplinary General Medical Practice: textbook / O.M. Hyrina, L.M. Pasiyeshvili, L.S. Babinets et al. Kyiv, 616 P., 2020
4. Fred Kusumoto. ECG Interpretation. From Pathophysiology to Clinical Application. Second edition / Fred Kusumoto. Springer, 2020.

Additional:

1. 150 ECG Cases / John Hampton, David Adlam, Joanna Hampton – Elsevier, 2019. 329 pages.
2. Anatomy of the cardiac conduction system. Pacing Clin Electrophysiol / Santosh K Padala, José-Angel Cabrera, Kenneth A Ellenbogen – NIH, PubMed, Sensors (Basel), 2021 Jan; 44(1):15-25. doi: 10.1111/pace.14107. – URL: <https://pubmed.ncbi.nlm.nih.gov/33118629/>
3. EKG | ECG Interpretation Made Easy: An Illustrated Study Guide For Students To Easily Learn How To Read & Interpret ECG Strips Paperback – NEDU LLC, 2021. 156 pages.
4. Electrocardiogram / Yasar Sattar, Lovely Chhabra – StatPearls [Internet] – Last Update: June 13, 2022. URL: <https://www.ncbi.nlm.nih.gov/books/NBK549803/>

13. Electronic information resources

1. World Health Organization. URL: www.who.int/ru/index.html.
2. European Regional Office of the World Health Organization. URL: www.euro.who.int.
3. Modern healthcare. URL: <https://www.modernhealthcare.com/vital-signs-healthcare-blog>
4. AHA: <https://www.heart.org/>
5. EHA <https://www.heartassociation.eu/>
6. EHA CRP: <https://cpr.heart.org/en/>
7. NICE: <https://www.nice.org.uk/>
8. PubMed: <https://pubmed.ncbi.nlm.nih.gov/>
9. Medscape: <https://www.medscape.com/>
10. NCBI: <https://www.ncbi.nlm.nih.gov/>
11. Electrocardiogram calculators: <https://en.my-ekg.com/calculation-ekg/ekg-calculations.html>