MINISTRY OF HEALTH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

Department of Family Medicine and Polyclinic Therapy

CONFIRMED by

Acting vice-rector for scientific and pedagogical work

_____ Eduard BURIACHKIVSKYI

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WORKING PROGRAM IN THE DISCIPLINE
ELECTIVE COURSE «ECG-DIAGNOSTICS IN THE PRACTICE OF A FAMILY DOCTOR»

Level of higher education: second (master's degree)

Field of knowledge: 22 «Health care»

Specialty: 222 «Medicine»

Educational and professional program: Medicine

2024

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 Hours: 90 Content modules: 3	Field of knowledge 22 «Health care» Specialty 222 «Medicine» Level of higher education second (master's degree)	*Full-time (day) education* *Elective discipline*
		Course: 6
		Semester: XI - XII
		Lectures (0 hours)
		Seminars (0 hours)
		Practical classes (30 hours)
		Laboratories (0 hours)
		Independent work (60 hours)
		including individual tasks (0 hours)
		Form of final control – Credit Test

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

The purpose is to master knowledge and formation of elements of professional competences in the field of instrumental diagnostics, in particular electrocardiography, in normal conditions and in case of cardiovascular and extracardiac pathology, improvement of skills and competences acquired during the study of the course.

The tasks of the discipline are the following:

1. To concretize the knowledge of the electrocardiogram evaluation algorithm.
2. To acquire deeper knowledge of normal variants and pathological variants of ECG.
3. To acquire the skills of timely detection of potentially dangerous changes on the ECG in order to prevent the occurrence of complications of certain pathologies.
4. To acquire deeper knowledge and improve skills in ECG diagnosis of emergency conditions and determination of emergency aid tactics.
5. To improve 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. To concretize the knowledge in documenting expert ECG interpretation.

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

General competencies:

GC1. 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 are:

SC1. Ability to collect medical information about the patient and analyze clinical data
SC 2. Ability to determine the necessary list of laboratory and instrumental studies and evaluate their results
SC 3. Ability to establish a preliminary and clinical diagnosis of the disease
SC 6. Ability to determine the principles and nature of treatment and prevention of diseases
SC 7. Ability to diagnose emergency conditions
SC 8. Ability to determine tactics and provide emergency medical care
SC 16. Ability to fill medical documentation, including electronic forms
SC 26. Ability to determine the management tactics of persons subject to dispensary supervision

Program learning outcomes are:

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 basic and clinical biomedical sciences, at a level sufficient for solving professional tasks in the field of 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. Identifying 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. Collecting complaints, history of life and diseases, assessing 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, evaluation of the information regarding the diagnosis (according to list 4), taking into account the age of the patient.
PLO 6. Establishing the final clinical diagnosis by making a reasoned decision and analyzing the received subjective and objective 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 the health care institution (according to the list 2).
PLO 7. Assigning and analyzing 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. Determination of the main 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 14. Determination of tactics and providing emergency medical care in emergencies (according to list 3) in limited time conditions according to existing clinical protocols and standards of treatment.
PLO 17. Performing medical manipulations (according to list 5) in the conditions of a medical institution, at home or work based on a previous clinical diagnosis and/or indicators of the

patient's condition by making a reasoned decision, 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. Determination of the management tactics of persons subject to dispensary supervision (children, pregnant women, workers whose professions require mandatory dispensary examination).

As a result of studying the discipline, the student of higher education should:
Know:

- electrophysiological basis of electrocardiography
- the method of recording the electrocardiogram in 12 standard leads and additional lead placements
- the algorithm for the ECG interpretation
- the methods of calculations and formulae used to interpret the electrocardiogram
- the main ECG signs of acute coronary pathology

Be able:

- to analyze the ECG signal and its related parameters
- to carry out a clinical evaluation of the ECG according to standard methods
- to carry out differential diagnosis and substantiate the clinical diagnosis using ECG interpretation
- to determine the tactics and provide emergency medical assistance in case of emergencies, the need for hospitalization
- to keep medical documentation

3. The content of the educational discipline

Content module 1.
Basics of electrocardiography

Topic 1. The anatomical and electrophysiological basis of the electrocardiography.

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. Proper 12-Lead ECG Placement. Additional Lead placements. Components of ECG.

Topic 2. Approach to ECG interpretation.

Heart rate. Examining the rhythm. ECG features of normal sinus rhythm. Determining the cardiac axis on the ECG. Origin and characteristics of waves and intervals of a normal electrocardiogram. ECG signs of atrial hypertrophy. ECG signs of ventricular hypertrophy.

Content module 2.
ECG changes in the case of heart rhythm and conduction disorders

Topic 3. Heart arrhythmias. ECG signs of ectopic rhythms.

Definition and classification of arrhythmias. Premature heart contractions: definition, classification. ECG signs of premature heart contractions. ECG signs of atrial rhythms.

Topic 4. ECG signs of paroxysmal heart rhythm disorders. Atrial fibrillation and atrial flutter.

Paroxysmal tachycardia: definition, classification. ECG signs of different forms of supraventricular tachycardias. Atrial fibrillation and atrial flutter: definition, forms, ECG signs. Paroxysmal ventricular tachycardia, ventricular flutter and ventricular fibrillation, ECG signs. The tactics of the family doctor in paroxysmal heart rhythm disorders.

Topic 5. ECG signs of heart conduction disorders.

Heart blocks: types, characteristics. ECG signs of sinoatrial, atrioventricular, intraventricular blocks. Wolff-Parkinson-White pattern. Lown-Ganong-Levine syndrome.

Content module 3.
Electrocardiography in the diagnosis of diseases of the cardiovascular system and extracardiac pathology.

Topic 6. ECG signs in case of inadequate blood supply to the heart.

ECG signs of ischemia, damage and necrosis of the myocardium. Acute coronary syndrome, symptoms, types. ECG findings in case of ST elevation-acute coronary syndrome (STE-ACS) and Non-ST elevation-acute coronary syndrome (NSTE-ACS). The evolution of electrocardiographic changes in ST-elevation myocardial infarction (STEMI). Localization of the occluded vessel in acute myocardial infarction. Vasospastic angina.

Topic 7. ECG diagnosis of the repolarization abnormalities.

Causes and main ECG signs of abnormal repolarization processes in the heart. Main characteristics and ECG pattern of early repolarization syndrome, prolongation and shortening of the QT interval, Brugada syndrome. ECG changes in pericarditis.

Topic 8. ECG changes in case of extracardiac pathology.

ECG changes due to electrolyte imbalance. ECG changes in pulmonary embolism. Electrocardiographic abnormalities in acute cerebrovascular events. ECG changes in case of the autonomic nervous system influence, in case of hypothermia.

4. The structure of the educational discipline

Themes	Number of hours					
	Total	including				
		lectures	seminars	practical classes	laboratories	Independent work
Content module 1. Basics of electrocardiography						
Topic 1. The anatomical and electrophysiological basis of the electrocardiography.	12	0	0	4	0	8
Topic 2Approach to ECG interpretation.	12	0	0	4	0	8
Total by content module 1	24	0	0	8	0	16
Content module 2. ECG changes in the case of heart rhythm and conduction disorders						
Topic 3. Heart arrhythmias. ECG signs of ectopic rhythms.	12	0	0	4	0	8
Topic 4. ECG signs of paroxysmal heart rhythm disorders. Atrial fibrillation and atrial flutter.	12	0	0	4	0	8
Topic 5. ECG signs of heart conduction disorders.	12	0	0	4	0	8
Total by content module 2	36	0	0	4	0	24
Content module 3. Electrocardiography in the diagnosis of diseases of the cardiovascular system and extracardiac pathology.						
Topic 6. ECG signs in case of inadequate blood supply to the heart.	12	0	0	4	0	8
Topic 7. ECG diagnosis of the repolarization abnormalities.	12	0	0	4	0	8
Topic 8. ECG changes in case of extracardiac pathology.	6		0	2	0	4
Total by content module 3	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.	Topic 1.	Hours
1.	The anatomical and electrophysiological basis of the electrocardiography	4
2.	Approach to ECG interpretation.	4
3.	Heart arrhythmias. ECG signs of ectopic rhythms.	4
4.	ECG signs of paroxysmal heart rhythm disorders. Atrial fibrillation and atrial flutter.	4
5.	ECG signs of heart conduction disorders.	4
6.	ECG signs in case of inadequate blood supply to the heart.	4
7.	ECG diagnosis of the repolarization abnormalities.	4
8.	ECG changes in case of extracardiac pathology.	2
	Total	**16**

5.4. Themes of laboratories
Laboratories are not provided.

6. Independent work of the student of higher education

No.	Theme	Hours
1.	Preparation for practical class 1	4
2.	Preparation for practical class 2	2
3.	Preparation for practical class 3	4
4.	Preparation for practical class 4	4
5.	Preparation for practical class 5	4
6.	Preparation for practical class 6	4
7.	Preparation for practical class 7	4
8.	Preparation for practical class 8	3
	Total	**29**

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), analysis of ECG.

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;
- independent work with a bank of test tasks, independent analysis and interpretation of ECG.

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 tasks 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 seminars:

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 task:

1. Assessment of the quality of the performance of the individual task:
   - the maximum score – 5, the minimum score – 3, the unsatisfactory score – 2.
2. Assessment of the presentation and defense of an individual task, 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 practical class

Score	Assessment criterion
Excellent «5»	The student of higher education 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. The tests are completed in full, all 100% of the answers are correct, the answers to the open questions are complete and justified. The student of higher education 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.
Good «4»	The student of higher education 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. The student of higher education 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.
Satisfactory «3»	The student of higher education 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. 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. The student of higher education 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.
Unsatisfactory «2»	The student of higher education 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 of higher education gives incorrect answers to questions, demonstrates poor knowledge of the conceptual apparatus and literary sources. The test has not been completed. The situation task has not been completed.

Criteria of assessment of the individual task

Score	Assessment criterion
Excellent «5»	Individual task and presentation have been made independently and are original. Their design meets the requirements. The business plan of the public (private) medical clinic is fully developed according to the proposed structure. The analysis is thorough and independent. The student is free to present the material. The content of the presentation is not overloaded with textual slides. The student formulates solid independent judgments supported by factual evidence and calculations. The data on the slides is presented mainly schematically using independently developed schemes, drawings, graphs, contains references to sources that are respectively designed and relevant. The student actively participates in the assessment of the business plan of competitors and is able to critically analyze it.
Good «4»	Individual task and presentation have been made independently. Their design meets the requirements. The business plan of the public (private) medical clinic is fully developed according to the proposed structure, but with some deviations. The analysis is carried out independently, but contains minor inaccuracies; the applicant explains the material well, formulates independent conclusions. The data in the presentation is presented primarily using self-developed schemes, drawings, graphs, contains references to sources that are appropriately designed and relevant. The student participates in the assessment of the business plan of competitors, but is not fully able to critically analyze it.
Satisfactory	Individual task and presentation have been made independently. Their design

«3»	meets the requirements with minor violations. The business plan of the public (private) medical clinic is partially developed according to the proposed structure. The analysis is only theoretical, descriptive and containing inaccuracies. The student explains the material unsure, formulates only general conclusions (or cannot formulate them at all). The data in the presentation is provided with reference to sources, but they are designed with errors. The student takes a passive part in assessment of the business plan of competitors, is not able to critically analyze it.
Unsatisfactory «2»	Individual task has not been completed. Individual tasks and presentations, which are not performed independently or borrowed from the Internet, shall not be taken into consideration.

Credit Test is considered, if the student of higher education 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 task. The student of higher education 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:

Average score (current academic performance) x 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 heart rate is generated by primary and secondary pacemakers?
2. What are the indications for taking the ECG?
3. What mistakes in interpretation can be made in case of inadvertent misplacement of limb leads and misplacement of precordial leads?
4. What are the additional ECG leads and what is their clinical significance? What is

technique of taking the ECG in additional leads and how to mark it on the ECG strip?

5. What are the normal components of the ECG? What processes in the heart are represented by each element of the ECG? What components of ECG can be defined as an isoelectric line?
6. What are the criteria for normal sinus rhythm? What is the standard paper output speed? Name the methods of heart rate calculation.
7. What ECG changes will you see in case of the cardiac axis deviation?
8. What are the P wave changes in case of the atrial hypertrophy?
9. What conduction abnormalities may be present in case of PR interval abnormalities?
10. What are voltage and non-voltage criteria of ventricular hypertrophy?
11. What changes in the ST segment can be noted on the ECG? What is the most important cause of ST segment abnormality?
12. What are the characteristics of a normal T wave? What are T wave abnormalities and in what cases do they occur?
13. What is U wave and what are the features of normal U wave?
14. Premature contractions: definition, classification, clinical significance.
15. ECG signs of premature atrial and junctional complexes.
16. ECG signs of premature ventricular complexes.
17. ECG signs of atrial rhythms.
18. Will the QRS complex always be normal with supraventricular extrasystoles?
19. What are the P wave changes depending on the origin of the impulse conduction?
20. What form of supraventricular tachycardia is originating from a single ectopic focus within the atria but outside of the sinus node?
21. What are the two conducting pathways within the AV node and what are their characteristics?
22. Give the definition of the term "paroxysmal". What are the types of paroxysmal supraventricular tachycardia?
23. What ECG features can be noted in AV nodal tachycardia?
24. What are the main ECG signs of atrial fibrillation?
25. What are the forms of atrial flutter? Name the ECG signs.
26. ECG features increasing the likelihood of VT than SVT with aberrant conduction?
27. What are the main signs of torsade de pointes?
28. What are the main ECG signs of ventricular flutter and fibrillation? Emergency aid.
29. What are the ECG features of first-degree AV block?
30. What are the ECG features of second-degree AV block, Mobitz I?
31. What are the ECG features of second-degree AV block, Mobitz II?
32. What are the ECG features of third-degree AV block?
33. What degree of SA block can be diagnosed from the 12-lead ECG? What are the ECG signs?
34. What are the ECG signs of right bundle branch block?
35. What are the ECG signs of left bundle branch block?
36. What are the ECG features of preexcitation syndromes? What type of SVT develops in patients with an accessory pathway?
37. What are the differences between myocardial ischemia, damage, and necrosis? What pathologies are related to acute coronary syndrome? What are the common clinical signs of acute coronary syndrome?
38. Name the main ECG characteristics of acute coronary syndrome without ST segment elevation.
39. Name the main ECG signs in acute myocardial infarction with ST segment elevation. Describe the evolution of changes in the ECG picture in acute myocardial infarction with ST segment elevation.

40. In which leads changes are noted in case of anterolateral myocardial infarction?
41. In which leads changes are noted in case of right ventricular myocardial infarction?
42. In which leads changes are noted in case of inferior myocardial infarction?
43. What is vasospastic angina and what are the ECG features?
44. What components of the ECG represent the processes of ventricular repolarization?
45. What formulas are used to calculate corrected QT interval?
46. What values of QTc indicate the long and short QT syndrome? What are the main causes of long QT syndrome?
47. What type of tachycardia can develop with prolonged QT syndrome and what are its possible consequences?
48. What characteristics are necessary to make a diagnosis of a shortened QT interval if the QTc is <360 ms?
49. What are the ECG features of Brugada syndrome?
50. What are the ECG features of pericarditis?
51. What electrolyte imbalances can lead to the prolongation of the QT interval?
52. In what electrolyte disorders can an inverted T waves be noted?
53. In what electrolyte disorders can peaked T waves be noted?
54. What electrolyte disorders can lead to a delay in the conduction of impulse from the atria to the ventricles?
55. In what electrolyte disorders the ST segment depression/elevation is noted?
56. What ECG signs can be noted in patients with hypothermia?
57. What variants of axis deviation and bundle branch block are noted in case of pulmonary embolism?
58. What are the general ECG signs in case of pulmonary embolism?
59. What ECG changes can be noted in patients with brain insult?

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