MINISTRY OF HEALTH OF UKRAINE
ODESSA NATIONAL MEDICAL UNIVERSITY
Faculty of Medicine
Department of General Practice

Confirmed by
Acting Vice-Rector for Scientific and Pedagogical Work
_____ Svitlana KOTYUZHINSKAYA
01 September 2023 year

Methodological recommendations
to independent work on the discipline
Faculty of Medicine, VI year
ELECTIVE COURSE " Express analysis ECG "

Developers: Olena Voloshyna, MD, Professor; Viktoria Bugeruk, PhD, Associate Professor; Larysa Kovalchuk, PhD, Associate Professor; Olena Naydenova, PhD, Associate Professor; Victoria Zbitneva, PhD, Assistant.

Topic independent work 1.

1.Topic: Anatomical and physiological bases of electrocardiography

The duration of the lesson is 6 hours

Objective: To improve knowledge about the structure and function of the cardiovascular system, physiological properties of the myocardium. Recall and improve knowledge of the anatomical and physiological foundations of ECG.

Basic concepts: Basic properties of the myocardium (excitability, conductivity, refractory, automatism, contractility). Conduction system of the heart. Cardiomyocyte action potential. Electrophysiological bases of ECG Dipole vector. Dynamics of the total electric vector. The origin of the P, Q, R, S, T waves, the P-Q, S-T, T-P intervals, and the P-Q and S-T segments of the electrocardiogram.

Equipment: ECG machine, slides for demonstration

Plan:

2. To control the basic level of knowledge, a higher education applicant must know the answers to the following questions:

- Anatomy of the cardiovascular system
- Physiology of the cardiovascular system.
- Conduction system of the heart.
- Main properties of the myocardium
- Structure of the conduction system of the heart
- Bioelectrical Bases of ECG
- ECG Devices

3. Formation of professional skills (mastering the skills of electrocardiogram analysis).

Recommendations (instructions) for completing tasks

 A higher education applicant should be able to:

- Recognize P, Q, R, S, T waves on the ECG, intervals P-Q, S-T, T-P, segments P-Q, S-T of the electrocardiogram and understand the mechanism of their formation and origin
- Be able to calculate the duration and amplitude of teeth, segments, intervals
- Apply electrodes to remove 12 standard leads
- Take a standard ECG, 12 leads

4. Wrapping Up:

Conducting student assessment, summing up, announcing the next topic of the lesson.

5. List of recommended literature (main, additional, electronic information resources):

Materials for the final stage of the lesson

1. The physiological properties of the myocardium include, in addition to:

A. Excitability
B. Conductivity
C. Refractory
D. Automatism
 D. Contractility
 E. Irritability

2. What is the name of the tissue that forms the conduction system of the heart? What property of the cells of this tissue ensures the automatism of the heart?

A. Musculoskeletal tissue

B. Connective tissue

B. Atypical muscle tissue. The ability to spontaneously generate excitation due to the presence of slow spontaneous depolarization of its cells in the diastole of the heart.

G. Epithelial

D. Nerva

3. Describe the sequence in which the arousal spreads through the heart:

A. Excitation occurs in the sinus node, spreads through the conduction system and the atrial myocardium, the atrioventricular node, the bundle of His, its legs and Purkinje fibers to the ventricular myocardium.

B. Excitation occurs in the atrioventricular node, spreads through the conduction system and the atrial myocardium, the sino-atrial node , the bundle of His, its legs and Purkinje fibers to the ventricular myocardium.

C. Excitation occurs in the sinus node, spreads along the conduction system and the atrial myocardium, the bundle of His, its legs and Purkinje fibers to the ventricular myocardium.

Literature

Main:

1. Hampton D., Edlem D., ECG in practice (translation of the 7th English edition). Kyiv: VSV "Medicine", 2020.-397 p.

2. Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.

Additional:

John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.

Electronic information resources:

1. http://www.ecgmadesimple.com

2. https://ekg.academy

3. https://www.skillstat.com/tools/ecg-simulator

 4. https://ecg.utah.edu

Topic of independent work 2

1. **Topic: Analysis of a normal ECG. Methods for determining the position of the electrical axis of the heart.**

Duration of the lesson - 2 hours

Amas: Learn how to analyze a normal ECG. To consolidate knowledge about the main waves, segments and intervals of ECG in normal and pathological conditions. Learn to determine the electrical axis of the heart using different methods.

Basic concepts:

Equipment: ECG film, tables for determining the electrical axis of the heart, slides for demonstration, patients

Plan:

2. To control the basic level of knowledge, a higher education applicant must know the answers to the following questions

- Basic ECG leads
- Main waves, intervals, and segments of the ECG
- How to identify the source of arousal
- What are the signs of sinus rhythm
- What are rhythm disorders
- What is the electrical axis of the heart
- What are the causes of deviation of the electrical axis of the heart

3. Formation of professional skills (mastering the skills of electrocardiogram analysis).

Recommendations (instructions) for completing tasks

A higher education applicant should be able to:

- Take a standard ECG, 12 leads
- Decipher a variant of a normal electrocardiogram.
- Analyze your heart rate and regularity and you.
- Identify the source of the rhythm
- Determine the electrical axis of the heart, visual methole, and alpha angle.
- Formulate a conclusion about specific changes on the ECG.

Materials for the final stage of the lesson

1. List the main ECG waves, intervals, and segments on the ECG. Memorize normal duration and amplitude values.
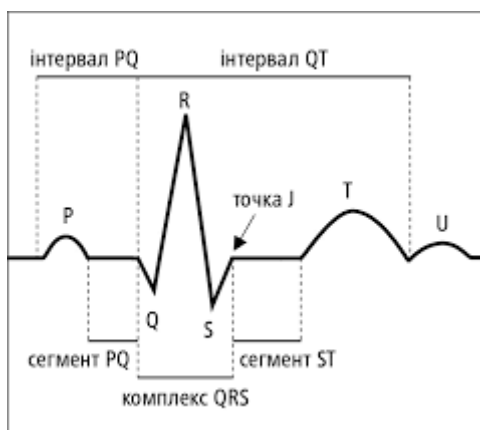

1. What is the name of the P wave, and what processes are displayed on the ECG
2. What is the normal duration of the QRS complex?
3. As evidenced by the increase in the duration of the QRS complex
4. What is the difference between a PQ segment and a PQ interval

2. Identify the source of the arousal. What is this rhythm called.

A. Sinus rhythm

B. Atrial

C. Pacemaker Migration

D. Atrial fibrillation

4. Determine the EVS of the heart using a non-visual method
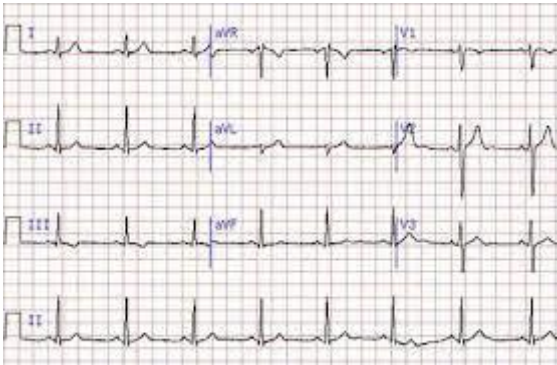
A. EVS deflected to the left

B. EVS deviated to the right

C. EVS is sharply deflected to the left

D. EMS not rejected

4. Wrapping Up:

Conducting student assessment, summing up, announcing the next topic of the lesson.

5. List of recommended literature (main, additional, electronic information resources):

Main:

1. Hampton D., Edlem D., ECG in practice (translation of the 7th English edition). Kyiv: VSV "Medicine", 2020.-397 p.

2.Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.
Additional:
          John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.
Electronic information resources:

1. http://www.ecgmadesimple.com

2. https://ekg.academy

3. https://www.skillstat.com/tools/ecg-simulator

4. https://ecg.utah.edu

Topic of independent work 3.
1. Topic: Standard and additional electrocardiographic leads.
The duration of the practical lesson is 6 hours
Amas: Learn how to record an ECG. Basic and additional methods of ECG recording (by Sky, Slopak) and indications for them. Devices for ECG diagnostics.
Basic concepts: electrodes for application, electrodes, preparation for ECG, safety precautions
Equipment: ECG machine, slides for demonstration, patients
Plan:
2. To control the basic level of knowledge, a higher education applicant must know the answers to the following questions:
   • Define electrocardiography
   • What is an electrocardiogram.
   • ECG Devices
   • Preparing for an ECG
   • Know the indications and contraindications for ECG
3. Formation of professional skills (mastering the skills of electrocardiogram analysis).
Recommendations (instructions) for completing tasks
A higher education applicant should be able to:
   • Check safety precautions before performing an ECG
   • Be able to apply electrodes
   • Take a standard ECG, 12 leads
   • Be able to apply electrodes to remove additional leads (right chest, according to Slopak, Neba)
   • Know the main ECG waves and their origin
   • Analyze heart rate and regularity
4. Wrapping Up:
Conducting student assessment, summing up, announcing the next topic of the lesson.
5. List of recommended literature (main, additional, electronic information resources):
Materials for the final stage of the lesson
   1. What preparation does the patient need to perform an ECG?
      A. Fasting
      B. After Physical Assault
      C. After resting for 10-15 minutes
      D. After taking medication

   2. At what speed is an ECG usually taken?

      A. 100 mm/s
      B. 50 mm/s
      V. 25mm/s
      G. 75 mm/s

3. In what order are the electrodes applied to remove standard leads and reinforced leads from the extremities?
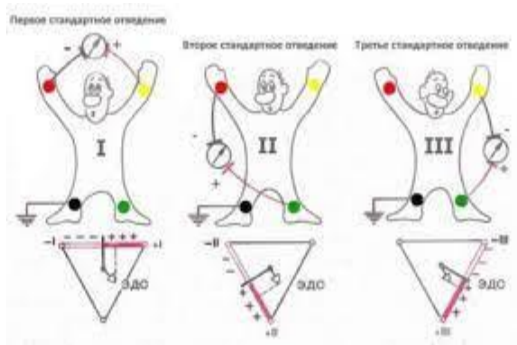
A. Red on the right hand, yellow on the left hand, black on the right foot, green on the left foot

B. Red on the left hand, yellow on the right hand, black on the right foot, green on the left foot

C. Red on the left foot, yellow on the left hand, black on the right foot, green on the left leg

4. What are the most common uses of extra leads on an ECG?
A. According to Harrison
B. According to Slopak
S. According to Sky
D. According to Clinton

Main:
1. Hampton D., Edlem D., ECG in practice (translation of the 7th English edition). Kyiv: VSV "Medicine", 2020.-397 p.
2.Richard B. Berry MD, Mary H. Wagner MD, in Sleep Medicine Pearls (Third Edition), 2015 Premature Beats.
Additional:
7. John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.

Electronic information resources:
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 4. https://ecg.utah.edu

Topic of independent work 5.

1. Topic: "Functional ECG tests".
Duration - 4 hours.
      Objective: To improve and structure students' knowledge of performing functional ECG tests. In almost 1/3 of angina cases, the ECG recorded at rest may be normal or have slight changes. Exercise ECG may show signs of relative insufficiency of coronary circulation.
      Formation of the ability to identify indications and contraindications, methods of functional ECG tests and evaluation of results for differential diagnosis of cardiovascular diseases.
Basic concepts: Standardized exercise tests (FN), 6-minute walk test, Master's ladder, treadmill,

bicycle ergometry (VEM), clino-orthostatic test, pharmacological tests, daily blood pressure monitoring (DBPM) and ECG.

Equipment: illustrative material, tables, equipment for VEM, treadmill, DBPM and daily ECG monitoring, heart rate variability (HRV).

Plan:

2. To control the basic level of knowledge, a higher education applicant must know the answers to the following questions:

- What ECG changes in different forms of coronary artery disease do you know?
- What are the ECG changes in metabolic and electrolyte disorders?
- What functional ECG tests do you know?
- What are the indications (patient selection criteria) for functional ECG tests?
- What are the contraindications for functional ECG tests?
- What Are the Methods for Assessing Physical Performance?
- What is the method of conducting standardized FN tests (6-minute walk test and Master's ladder), criteria for their evaluation?
- What is the method of conducting non-standardized FN tests: VEM, treadmill, criteria for their evaluation?
- What is the informative value of functional ECG tests?
- Recommendations for coronary ventriculography with a sharply positive ECG test?
- What are the indications, methodology and evaluation of pharmacological samples?
- What are the main criteria for selecting patients for DBPM and ECG?
- What are the main methods for assessing HRV

3. Formation of professional skills (mastering the skills of electrocardiogram analysis).

Recommendations (instructions) for completing tasks

A higher education applicant should be able to:

- Identify signs of focal (post-infarction cardiosclerosis) and diffuse myocardial changes (impaired repolarization processes associated with ischemia, metabolic and electrolyte changes) and assess them
- Formulate a conclusion based on ECG data
- To give a clinical assessment of these VEM and treadmill
- Evaluate pharmacological ECG tests
- To give a clinical assessment of DBPM data and daily ECG monitoring

Materials for the final stage of the lesson

Tests:

1. The criterion for the preservation of those FN is the possibility of performing the latter with power:
   A. 50 W
   V. 75 W
   pp. 100 W
   D. 125 W
   E. 150 W

2. Submaximal heart rate is as a percentage of maximum heart rate
   A. 80 per cent
   B. 75%

p. 85%
D. 90%
E. 60 per cent

3. Heart rate, which characterizes the performance of the maximum FN, is calculated according to the formula:
A. Equal to the patient's age (full years)
B. 220 – age
C. Age multiplied by 2
D. 300 - age
E. Age + 100

4. The nature of the reaction of the cardiovascular system to the load, characterized by an increase in SBP and a decrease in DBP, is:
A. normo tonic
B. hypertensive
S. Dystonic
D. hypotonic
E. is an indicator of an improperly conducted sample

5. The main indications for stress tests are:
A. Diagnosis of chronic forms of coronary artery disease
C. Assessment of the functional state of patientsS. Evaluation of the effectiveness of anti-ischemic therapy
E. Evaluation of the effectiveness of revascularization interventions
E. all of the above

6. Clinically significant changes in the ECG characterizing myocardial ischemia are not the following:
A. horizontal ST-segment depression
C. ST segment elevation
C. Cosmogonal ST-segment depression
D. Obliquely ascending ST-segment depression
All of the above

7. Normal values of the circadian index for healthy people are:
A. 1.02 – 1.12
Q. 1.12 – 1.22
pp. 1.22 – 1.45
D. 1.45- 1.65
E. 1.65-1.85

8. The indicators of a "normal" daily ECG include:
A. ST-segment depression up to 2 mm in FN
C. ST-segment elevation to 1 mm at night
C. changes in the amplitude of the T wave from positive to negative values
E. all of the above

9. Frequent ventricular arrhythmias during daily ECG monitoring include:
A. more than 20 per hour
C. more than 30 per hour
S. more than 60 per hour

D. more than 80 per hour

E. more than 100 per hour

10. What shape of the P wave is characteristic of atrial paroxysmal tachycardia:

A. Zubets R positive

B. P wave negative

C. P wave biphasic

E. All answers are correct

Literature:

Main:

1. Kusumoto FM, Schoenfeld MH, Barrett C. 2018 ACC/AHA/HRS Guideline on the Evaluation and Management of Patients With Bradycardia and Cardiac Conduction Delay: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines, and the Heart Rhythm Society. J Am Coll Cardiol. 2019 Aug 20; 74(7):932-987. doi: 10.1016/j.jacc.2018.10.043. Epub 2018 Nov 6. Erratum in: J Am Coll Cardiol. 2019 Aug 20; 74(7):1014-1016. PMID: 30412710.

Additional:

2. Sick Sinus Syndrome: A Review. Semelka M, Gera J, Usman S. Am Fam Physician. 2013 May 15; 87(10):691-696. - https://www.aafp.org/afp/2013/0515/p691.html

3. Jabbour F, Kanmanthareddy A. Sinus Node Dysfunction. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK544253/

Electronic information resources:

1. http://www.ecgmadesimple.com
2. https://ekg.academy
3. https://www.skillstat.com/tools/ecg-simulator
4. https://ecg.utah.edu
5. http://fd.org.ua

Topic independent work 6.

1. The: " Disorders of automatism, sinus node dysfunction. Sick sinus node syndrome".
The duration 6 hours.

Objective: Improve and structure students' knowledge of diseases characterized by dysfunction of the sinus node with bradycardia and heart failure, which are of multifactorial origin. Formation of the ability to decode, interpret and carry out differential diagnosis of automaticity disorders at the level of the sinus node for emergency ECG diagnosis of heart lesions and the formation of electrophysiological thinking.

Basic concepts: Sinus bradycardia, sinus arrhythmia, replacement rhythms, sinoatrial block, atrial fibrillation with slow ventricular response, bradycardia-tachycardia syndrome.

Equipment: illustrative material, tables, thematic patients

Plan:

2. Organizational measures (greetings, verification of those present, notification of the topic, purpose of the classes, motivation of higher education students to study the topic).

Control of the reference level of knowledge is carried out by the method of frontal survey. To control the reference level of knowledge, a higher education student should

know the answers to the following questions:
1. What rhythm and conduction disorders are included in the concept of sick sinus node syndrome?
2. Mechanism of sick sinus node syndrome development.
3. List the causes of pauses on the ECG of more than 2 seconds.
4. What is the mechanism of tachycardia-bradycardia syndrome?
5. Mechanisms and causes of sino-atrial blockades.
6. ECG signs of sino-atrial blockade of the 2nd degree, type I
7. ECG signs of sino-atrial blockade of the 2nd degree, type II
8. ECG signs of sino-atrial blockade of the 3rd degree
9. Recommendations for stimulation in sinus node dysfunction

3. Formation of professional skills (mastering the skills of analyzing electrocardiogram).

Recommendations (instructions) for performing tasks

The applicant for higher education should be able to:
1. Decipher the variant of a normal electrocardiogram.
2. To analyze the regularity of heart contractions and to determine the signs of a violation of automaticity.
3. Assess the normal position, frequency and amplitude of P waves.
4. To determine the duration of the pause on the ECG when the P wave drops out with different types of blockades.
5. Assess the frequency and regularity of ventricular contractionsFormulate a conclusion about specific changes on the ECG.

*Materials for the final stage of the classes*
Situational tasks

1. The female, 73 years old, complains of a feeling of nausea, loss of consciousness. She was hospitalized in the emergency department. The pulse is 40 per minute, irregular. Single pauses are periodically noted. Blood pressure 90/50 mm Hg. The ECG is presented below. What rhythm disorders does the patient have?
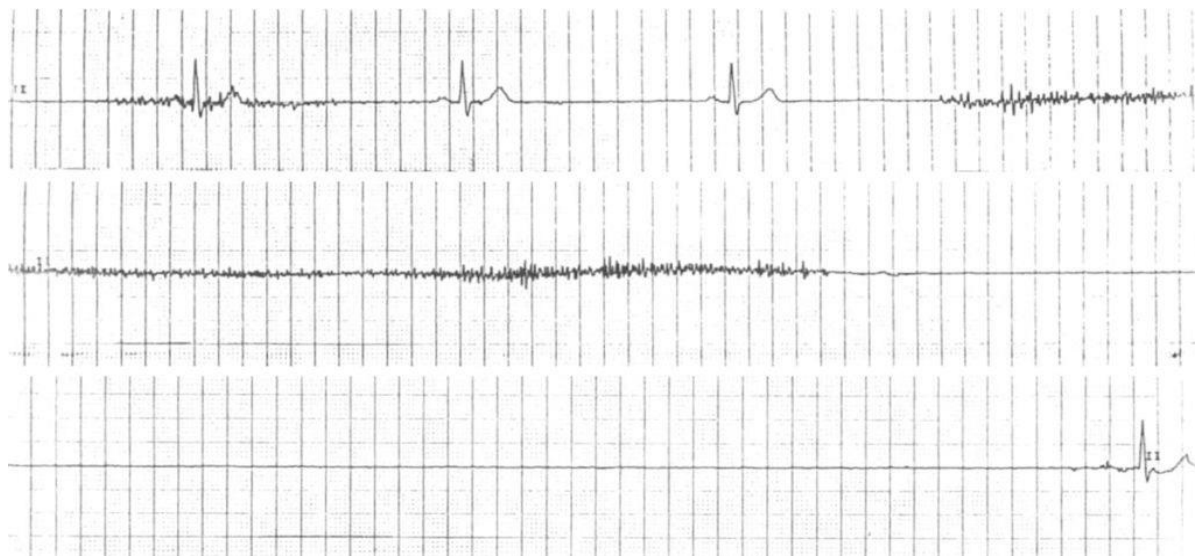
A. Sinus arrest with absence of sinus node activity for more than 3 seconds
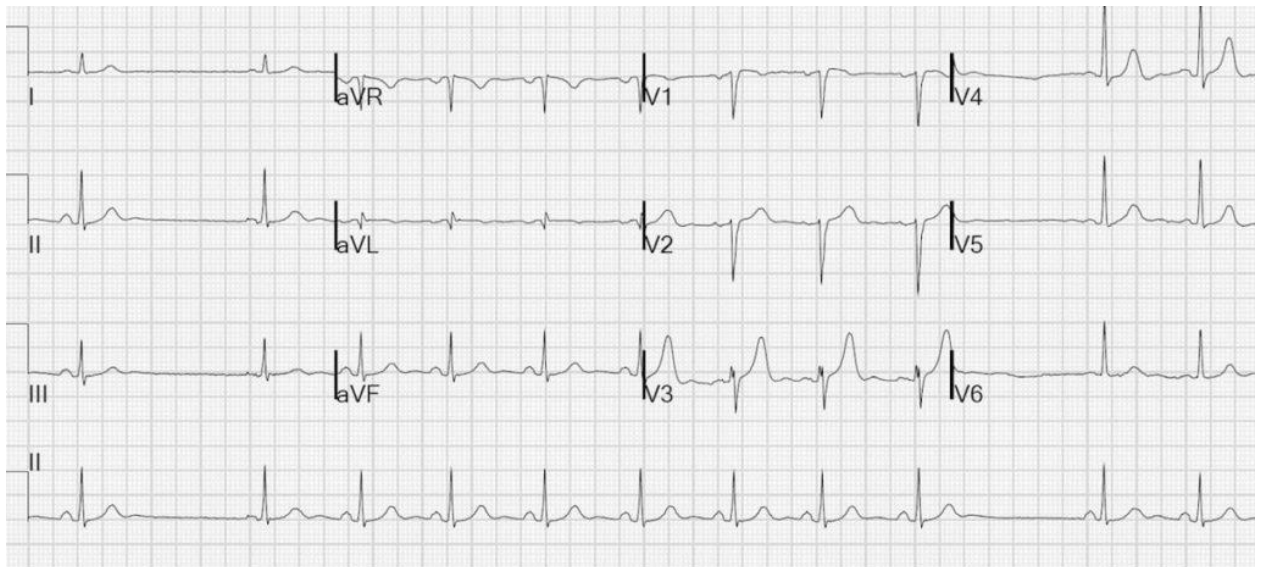B. Sinoatrial block of the 2nd degree, type 1
S. Ventricular fibrillation

D. Sinoatrial blockade of the 3rd degree

E. Complete AV block

2. An 83-year-old patient on the second day of his stay in a therapeutic hospital with a diagnosis of "IHD: angina pectoris III FC" had heart failure, dizziness, and his well-being deteriorated sharply. Objectively: heart sounds are weakened, nonrhythmic, systolic murmur at the apex. Heart rate is 74/min., there is no pulse deficiency. AT - not determined. The ECG is presented below. What is the patient's heart rhythm disorder?
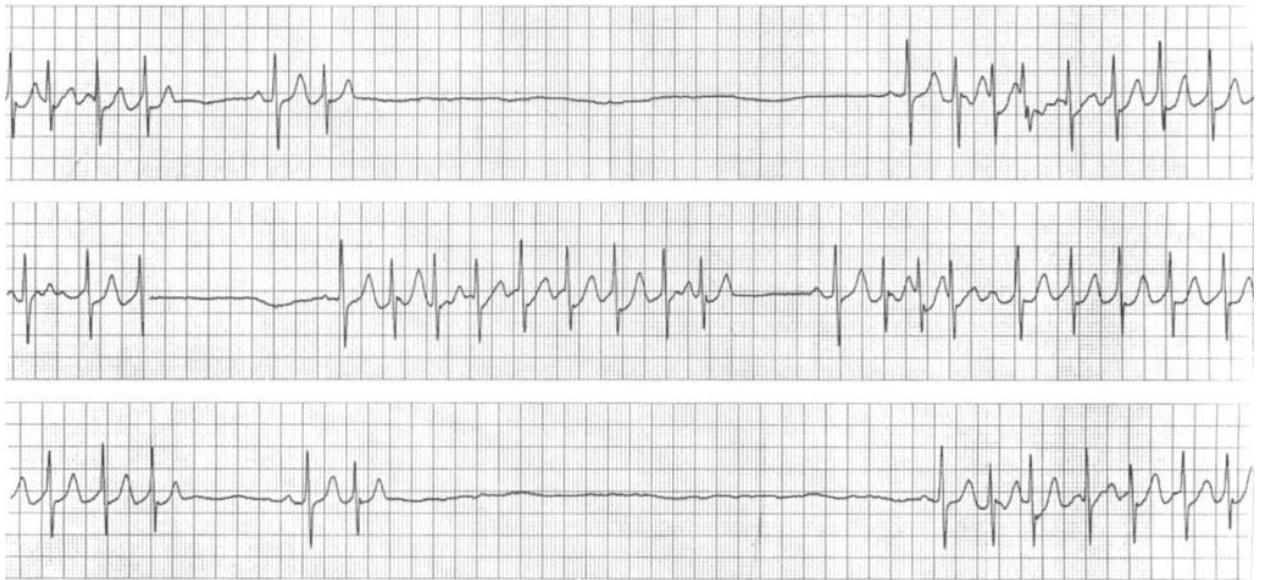
    A. Sino-atrial blockade of the 2nd degree.

    B. Paroxysms of atrial tachycardia

    C. Complete atrio-ventricular block.

    D. Bradycardia-tachycardia syndrome.

    E. Paroxysms of ventricular tachycardia.

3. An 80-year-old patient complains of irregular heart activity, general weakness, noise in the head. Objectively: heart sounds are unevenly muffled, non-rhythmic, systolic murmur over the aorta. Heart rate - 66/min. AT - 162/65 mm. The ECG is presented below. What is the patient's heart rhythm disorder?

A. Sinoatrial block of the 2nd degree, type II
B. Sinoatrial block of the 2nd degree, type I
C. Atrial extrasystole
D. Sinoatrial blockade of the 3rd degree
E. Atrio-ventricular blockade of the 2nd degree, Möbitz II

4. Summing up:
Conducting student assessment, summarizing, announcing the next topic of the lesson.
5. List of recommended literature (main, additional, electronic information resources):
Main:

4. Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.
5. Sick Sinus Syndrome: A Review. Semelka M, Gera J, Usman S. Am Fam Physician. 2013 May 15;87(10):691-696. - https://www.aafp.org/afp/2013/0515/p691.html
6. Kusumoto FM, Schoenfeld MH, Barrett C. 2018 ACC/AHA/HRS Guideline on the Evaluation and Management of Patients With Bradycardia and Cardiac Conduction Delay: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines, and the Heart Rhythm Society. J Am Coll Cardiol. 2019 Aug 20;74(7):932-987. doi: 10.1016/j.jacc.2018.10.043. Epub 2018 Nov 6. Erratum in: J Am Coll Cardiol. 2019 Aug 20;74(7):1014-1016. PMID: 30412710.

Additional:
7. Jabbour F, Kanmanthareddy A. Sinus Node Dysfunction. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK544253/

Electronic information resources:
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3. https://www.skillstat.com/tools/ecg-simulator
4. https://ecg.utah.edu

Topic of independent work 7.
1. The topic: " ECG diagnosis and differential diagnosis of atrial fibrillation and atrial flutter ".
The duration of the topic 4 hours.

Objective: Improve and structure students' knowledge of atrial fibrillation and flutter. The ability to decipher, interpret and carry out differential diagnosis of atrial fibrillation and flutter on the ECG contributes to the rapid and more reliable diagnosis of heart lesions, the formation of electrophysiological thinking, and helps to prevent possible complications in such common rhythm disorders.

Basic concepts: atrial fibrillation, atrial flutter, micro re-entry, macro re-entry, irregular-irregular rhythm, f waves, F waves, ventricular complex amplitude alternation.

Equipment: illustrative material, tables, thematic patients

Plan:

2. Organizational measures (greetings, verification of those present, notification of the topic, purpose of the classes, motivation of higher education students to study the topic).

Control of the reference level of knowledge is carried out by the method of frontal survey. To control the reference level of knowledge, a higher education student should know the answers to the following questions:

1. Define atrial fibrillation (AF).
2. Mechanisms of development of atrial fibrillation.
3. ECG signs of atrial fibrillation.
4. Classification of AF (by frequency of ventricular contractions, by amplitude of f waves, by duration).
5. Define atrial flutter (AFl).
6. Mechanisms of development of atrial flutter.
7. ECG signs of atrial flutter.
8. Classification of AFl (by isthmus-dependency, by frequency of ventricular contractions, by variants of conduct).
9. Differential diagnosis of AF and AFl.

3. Formation of professional skills (mastering the skills of analyzing electrocardiogram).

Recommendations (instructions) for performing tasks

The applicant for higher education should be able to:

1. Decipher the variant of a normal electrocardiogram.
2. Analyze the regularity of heart contractions and see the absence of sinus rhythm.
3. Calculate the frequency of ventricular contractions in different types of AF and AFl.
4. Determine the signs of an emergency. Formulate a conclusion about specific changes on the ECG.

*Materials for the final stage of the classes*

Situational tasks

No. 1. A 42-year-old patient with mitral valve disease complains of shortness of breath, irregular heartbeat, swelling of the lower extremities. Such complaints arose more than a month ago. Physically: the pulse is arrhythmic (both in frequency and amplitude of pulse waves) with an average frequency of 80/min. When auscultating the heart, the number of heart sounds per minute is 10-15 more than pulse waves on the radial artery. Moist rales are heard above the basal parts of the lungs, the legs are swollen. Blood pressure 135/80 mm Hg. The

ECG is presented below. What heart rhythm disorder does the patient have?
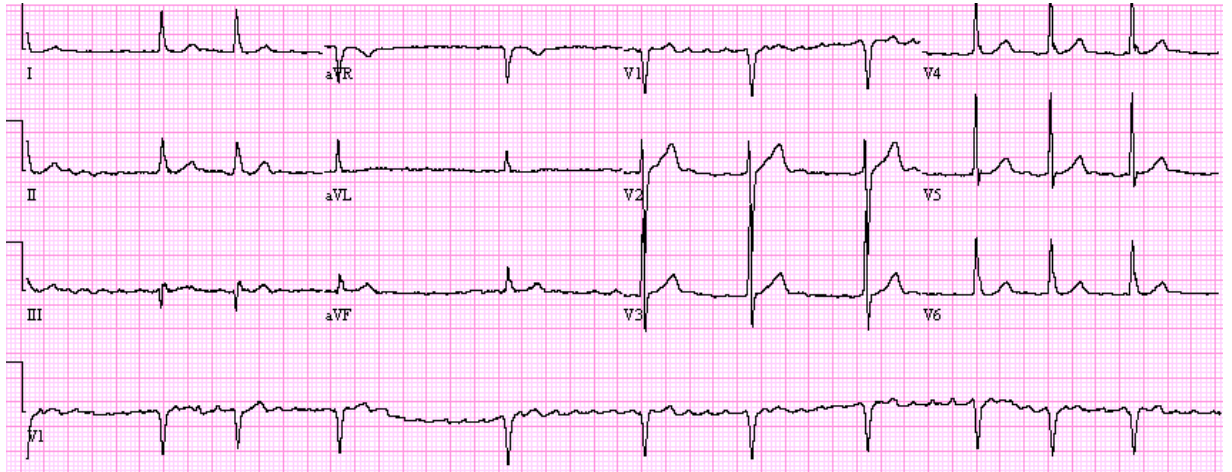
A. Atrial fibrillation
B. Frequent atrial extrasystole
S. Ventricular extrasystoles
D. Ventricular fibrillation
E. Incomplete atrio-ventricular blockade

N 2. The patient, 59 years old, complains of interruptions in the work of the heart, increased fatigue, dizziness. What rhythm disturbance was detected on the ECG?
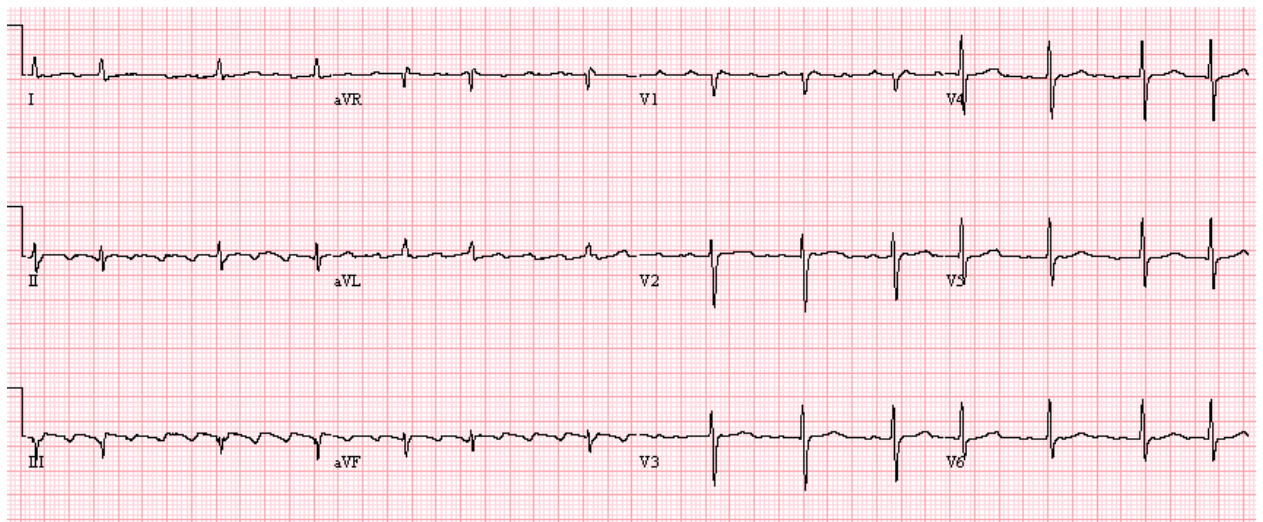

A. Sinus arrhythmia
B. Extrasystole
C. Atrial fibrillation
D. Atrial flutter, irregular shape
E. 2nd degree AV block

No. 3. A 54-year-old patient developed night attacks of shortness of breath, chest pains, and dizziness during physical exertion. BP-115/70 mm Hg, palpable rhythmic pulse 60/min, normal filling. What heart rhythm disorder did the ECG reveal?
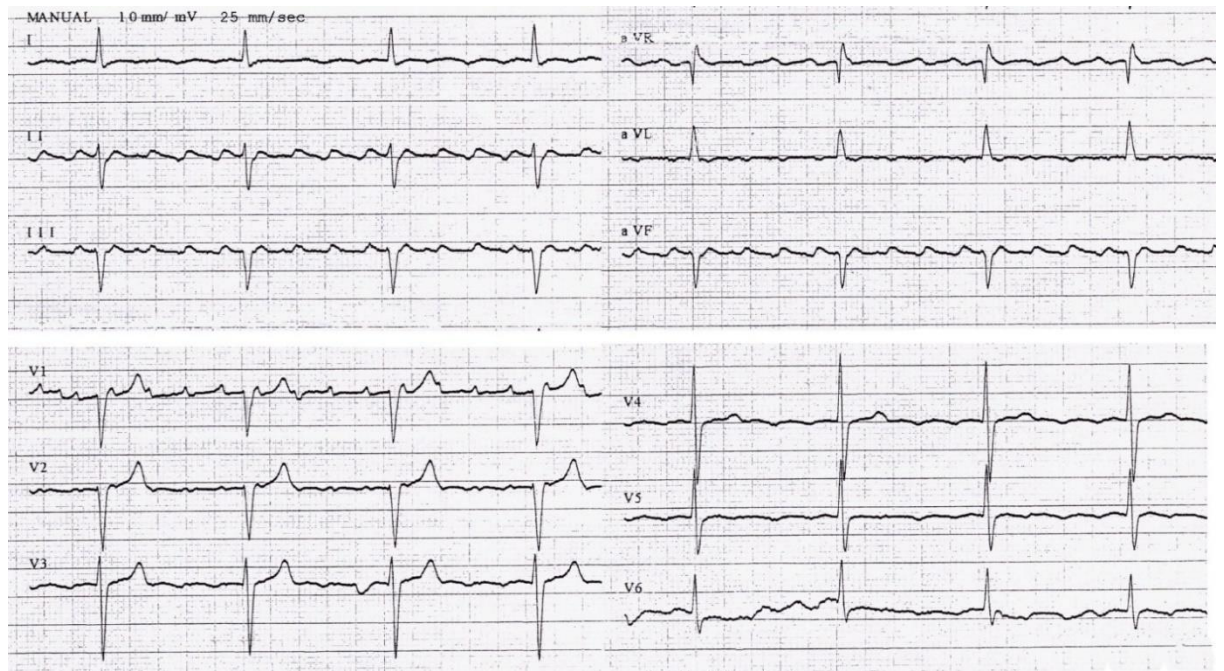
A. Classic form of atrial flutter with arrhythmic conduction.
B. Classic form of atrial flutter with 2:1 conduction.
C. Classic form of atrial flutter with 4:1 conduction.
D. Atrial fibrillation
E. Isthmus-independent form of atrial flutter with 4:1 conduction.

No. 4. A 68-year-old patient complains of periodic squeezing pain in the heart, shortness of breath during physical exertion. My brother died at the age of 34 from a heart disease with similar symptoms. Objectively: pulse - 44/min, non-rhythmic. Blood pressure -130/80 mm Hg. What heart rhythm disorder was detected on the ECG?
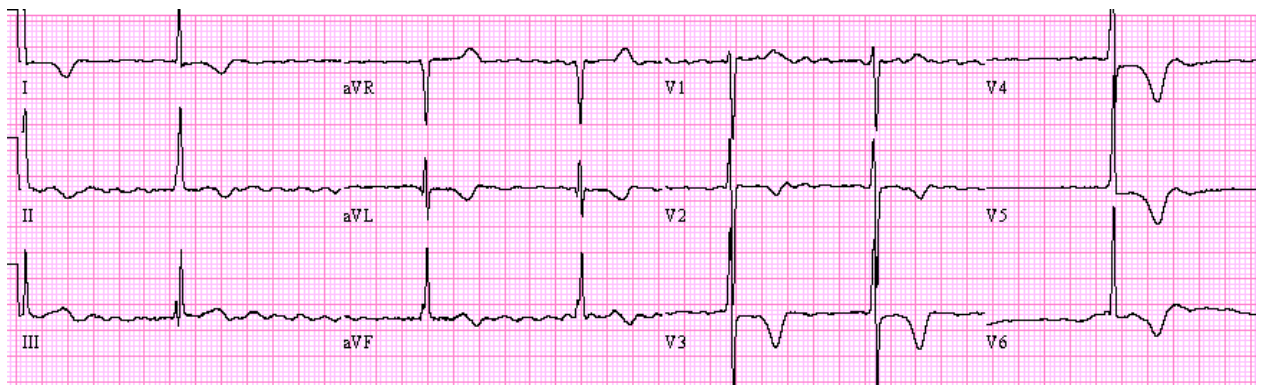
A. Bradysystolic atrial fibrillation. A common anterolateral non-Q-IM of unknown origin
B. Extrasystole
C. Bradysystolic atrial fibrillation
D. Atrial flutter, irregular shape
E. AV block of the 2nd degree, Möbitz 2

4. Summing up:
Conducting student assessment, summarizing, announcing the next topic of the lesson.
5. List of recommended literature (main, additional, electronic information resources):
<u>Main:</u>

1. Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.
2. Richard B. Berry MD, Mary H. Wagner MD, in Sleep Medicine Pearls (Third Edition), 2015 Premature Beats.

Additional:
3. John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.
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3. https://www.skillstat.com/tools/ecg-simulator
4. https://ecg.utah.edu

Topic of independent work 8.
1. Topic: "Syndromes of premature excitation of the heart ventricles ".
Duration - 6 hours
Purpose: to repeat the causes of conduction disorders, to learn how to identify ECG signs of premature excitation of the ventricles of the heart and to carry out differential diagnosis.
Basic concepts: conduction disorders, Wolff-Parkinson-White syndrome (WPW syndrome), shortened P-Q(R) syndrome or Clerk-Levy-Cristesco syndrome (CLC syndrome).
Equipment: ECG films, slides for demonstration, patients.
Plan:
2. Organizational measures (greeting, checking attendees, communicating the topic, the purpose of the lesson, motivating students to study the topic).
Control of the basic level of knowledge is carried out by the method of frontal questioning. To control the basic level of knowledge, a higher education applicant must know the answers to the following questions:

- What is premature excitation of the ventricles of the heart?
- Additional (abnormal) pathways of AV conduction are possible.
- Causes of premature excitation of the ventricles of the heart.
- What is WPW syndrome?
- Clinical symptoms of WPW syndrome.
- ECG signs of WPW syndrome.
- What is CLC syndrome?
- What is the clinical difference between the phenomenon of a shortened PQ interval and CLC syndrome, clinical symptoms of CLC syndrome.
- ECG signs of CLC syndrome.

3. Formation of professional skills (mastering the skills of electrocardiogram analysis).
Recommendations (instructions) for completing tasks
 A higher education applicant should be able to:

- Find ECG signs of WPW syndrome.
- Find ECG signs of CLC syndrome.

*Materials for the final stage of the lesson*
Situational tasks:

1. A 16-year-old girl has a history of episodes of loss of consciousness, complaints of headache, cardialgia, palpitations, sleep disturbances, the condition worsens with physical exertion. Objectively: pulse - 66 in 1 minute. No murmurs were detected on auscultation. The ECG is presented below. What is the most likely cause of this condition?

A. Wolff-Parkinson-White syndrome
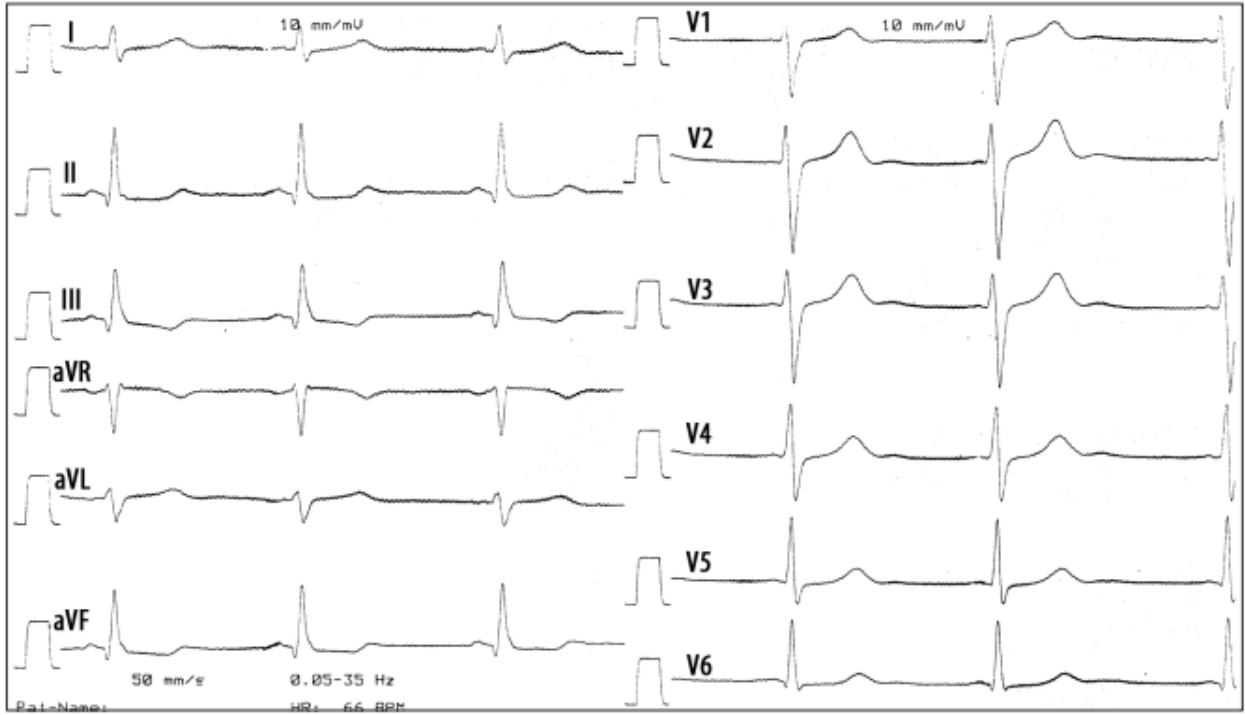
B. Complete atrioventricular block
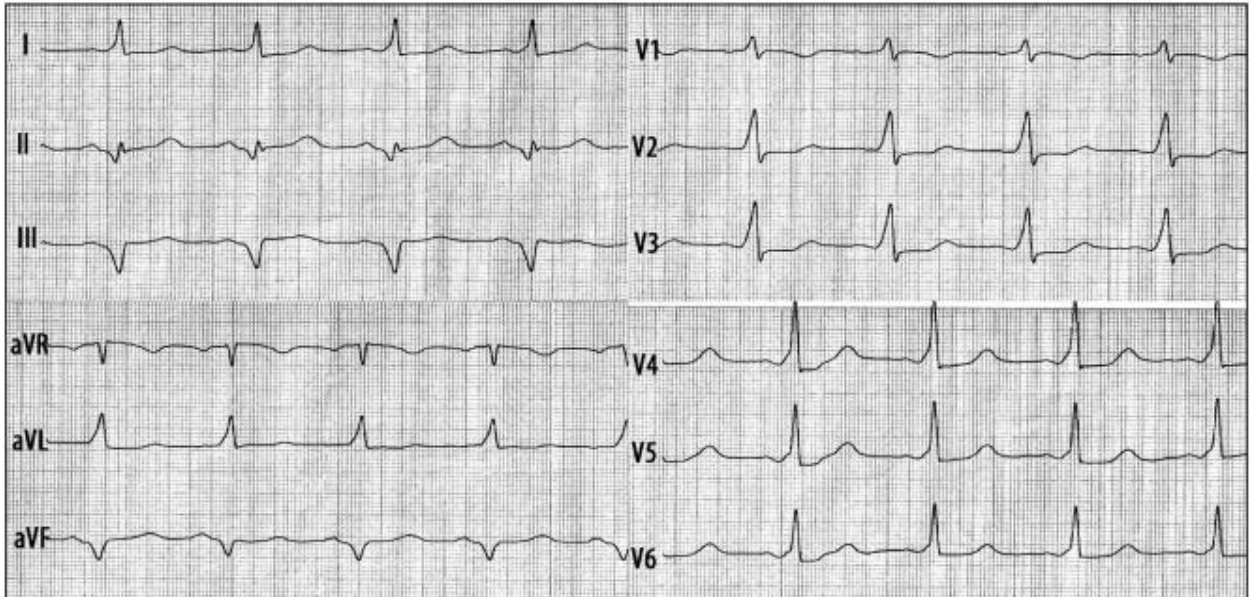B. Morgagni-Adams-Stokes syndrome
D. Atrial extrasystole
E. Shortened PQ syndrome

2. How do you interpret the changes on the ECG below?
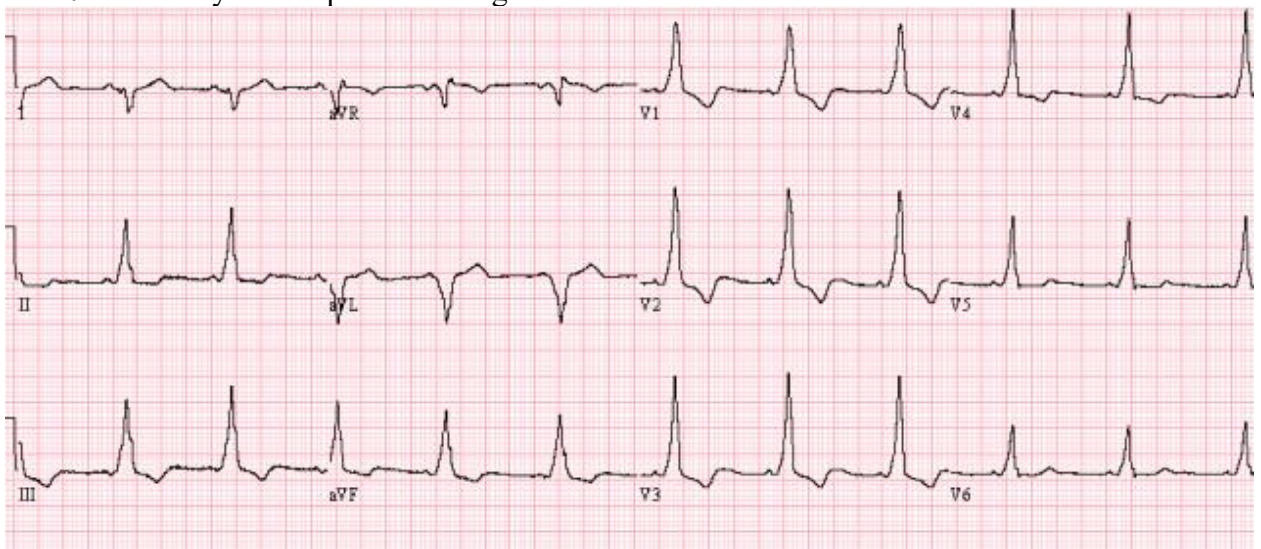
A. **Wolff-Parkinson-White syndrome**
B. Acute pulmonary heart
B. RV hypertrophy with systolic overload
D. Coronary artery disease: non-Q-IM

E. Complete blockade of the PNWH

3. Patient M., 28 years old, developed palpitations, dizziness, and pronounced weakness after physical exertion. The ambulance doctor stated: the skin is pale. The pulse is about 110 in 1 minute. Blood pressure – 90/60 mm Hg. Century. Other physical data without features.

A. Vegetative-vascular dystonia with extrasystole
B. Morgagni-Adams-Stokes syndrome
B. Wolff-Parkinson-White syndrome
D. Frederick syndrome (atrial flutter)
D. Atrioventricular block
4. Summing up:
Conducting student assessment, summing up, announcing the next topic of the lesson.
5. List of recommended literature (main, additional, electronic information resources):
Main:

1. Hampton D., Edlem D., ECG in practice (translation of the 7th English edition). Kyiv: VSV "Medicine", 2020.-397 p.
2. Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.

Additional:
John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.
Electronic information resources:
1. http://www.ecgmadesimple.com
2. https://ekg.academy
3. https://www.skillstat.com/tools/ecg-simulator
 4. https://ecg.utah.edu

Topic 9.

1. The topic: " ECG-signs of the left and right ventricular premature beats. Classification ES by B.Lown".
The duration of the topic is 4 hours.
Objective: To improve and structure students' knowledge of extrasystoles arrhythmia. The ability to decipher, interpret and conduct differential diagnosis of extrasystole on ECG

undoubtedly contributes to a faster and more reliable diagnosis of lesions of certain parts of the heart, the formation of electrophysiological thinking.

Basic concepts: extrasystole, compensatory pause, allorhythmia.

Equipment: illustrative material, tables, thematic patients

Plan:

2. Organizational measures (greetings, verification of those present, notification of the topic, purpose of the classes, motivation of higher education students to study the topic).

Control of the reference level of knowledge is carried out by the method of frontal survey. To control the reference level of knowledge, a higher education student should know the answers to the following questions:

1. Define extrasystole.
2. Mechanisms of extrasystole development.
3. Classification of extrasystoles arrhythmias (according to the localization of the ectopic focus, frequency, form).
4. Differential diagnosis of functional and organic extrasystoles.
5. Determination of compensatory pause.
6. ECG signs of ventricular extrasystole.
7. Differential diagnosis left- and right ventricular premature beats.
8. Definition of allorhythmia, types of allorhythmia.
9. Classification ventricular premature beats by B.Lown.

3. Formation of professional skills (mastering the skills of analyzing electrocardiogram).

Recommendations (instructions) for performing tasks

The applicant for higher education should be able to:

1. Decipher the variant of a normal electrocardiogram.
2. Analyze the regularity of heart contractions and the number of extrasystoles.
3. Calculate the heart rate for different types of extrasystole.
4. Determine the origin of extrasystoles.
5. Dif.diagnosis left- and right ventricular premature beats.
6. Formulate a conclusion about specific changes on the ECG.

Materials for the final stage of the classes

Situational tasks

- The patient, 33 years old, complains of a feeling of interruption in the work of the heart. Objectively: arrhythmic pulse, 76 per minute, single pauses are periodically noted (after 3-5 pulse waves). BP 130/80 mmHg The ECG is presented below. What rhythm disturbance occurs in the patient?
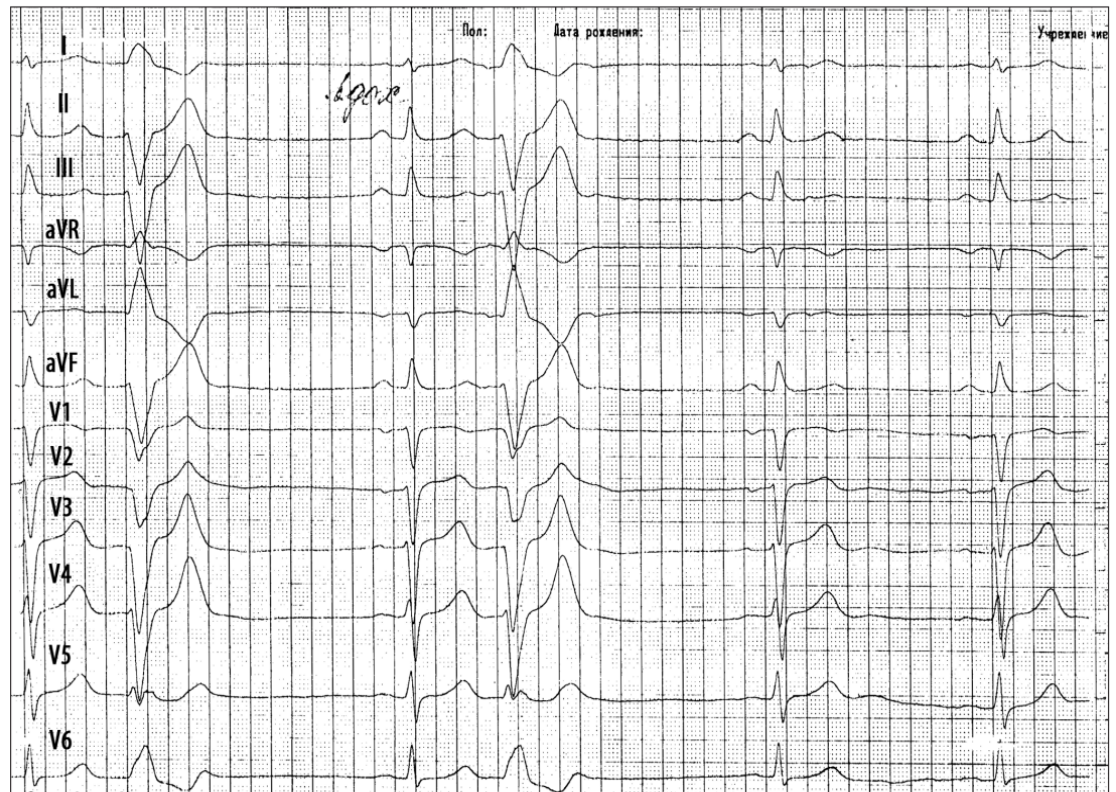
Describe the provided ECG. Justify your answer to the problem.
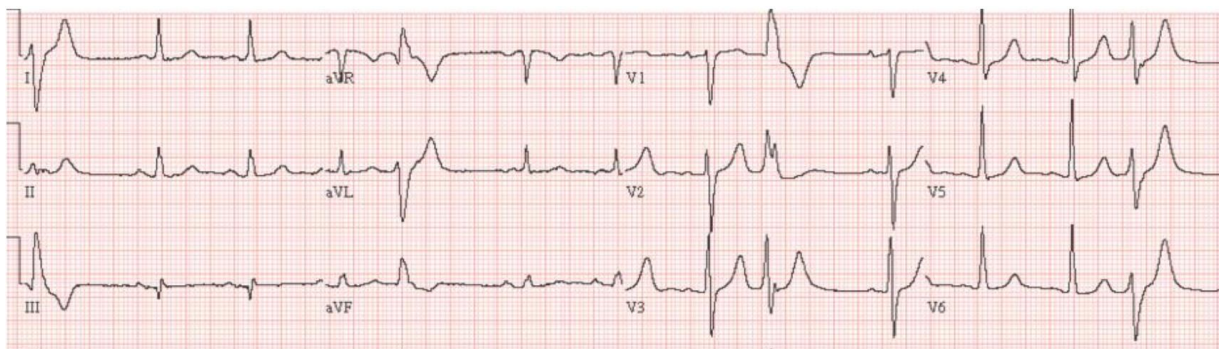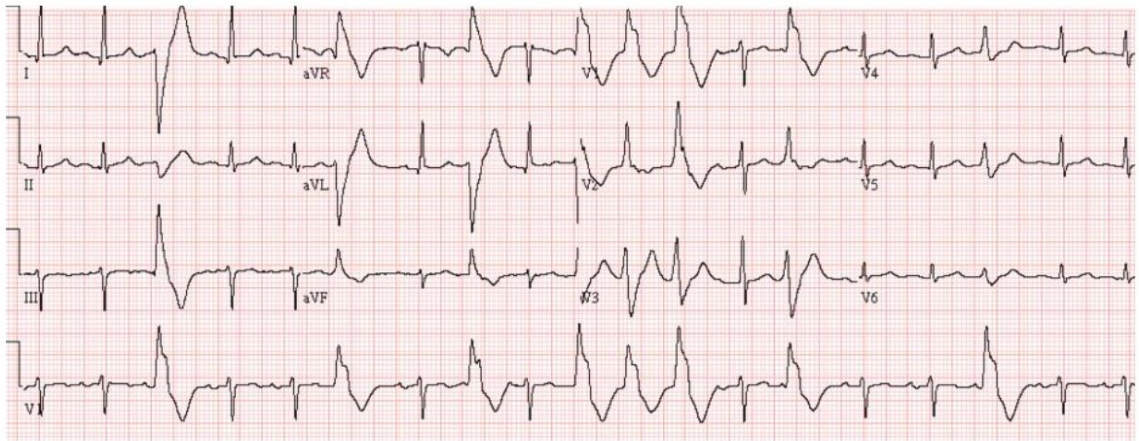

A. Right ventricular extrasystole.

B. Left ventricular extrasystole.

C. Supraventricular extrasystole

D. Sinoatrial blockade.

E. Incomplete AV block.

- Give a conclusion on the given ECG. Make a differential diagnosis of arrhythmias. Justify the conclusion.
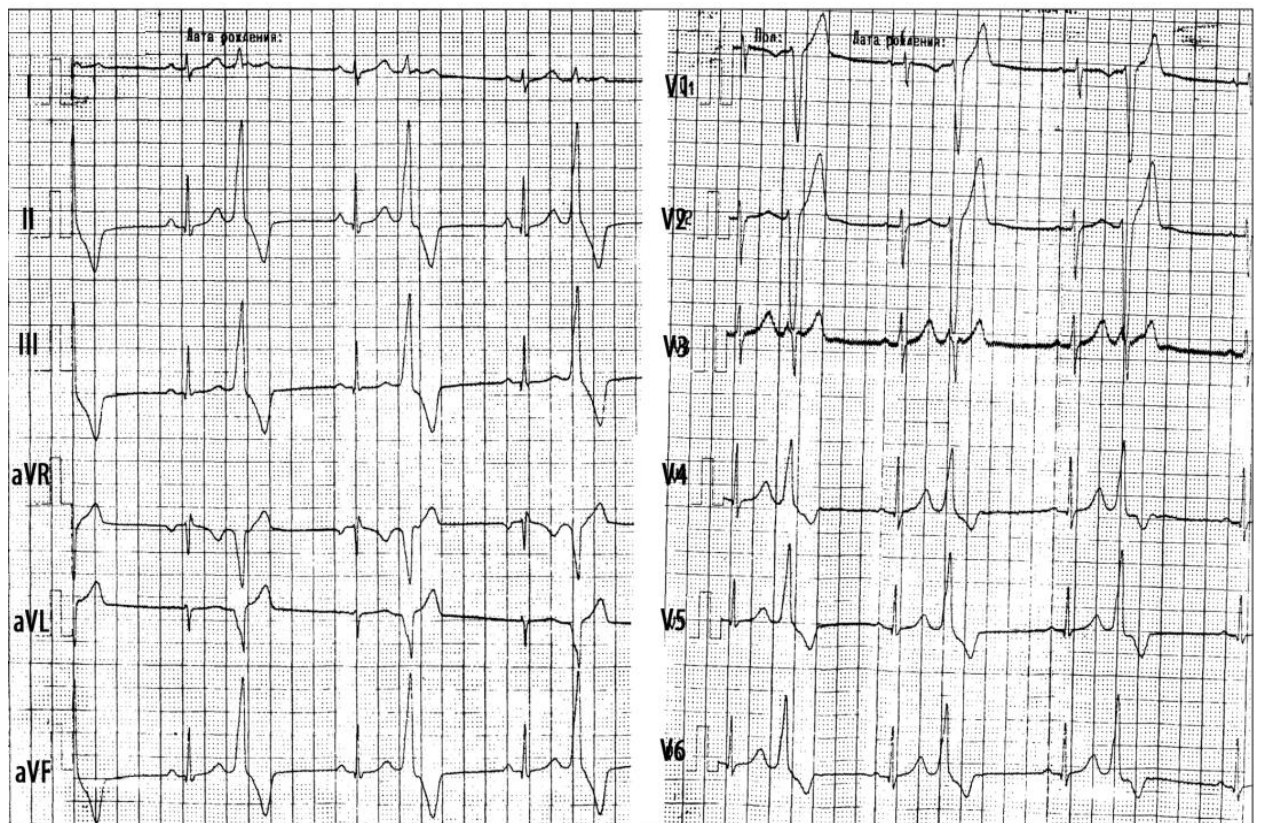

- A patient of 64 years old on the fourth day of stay in a therapeutic hospital with a diagnosis of "CHD: Angina pectoris III FC had a heartbeat and sharply worsened her health. Objectively: heart sounds are weakened, arrhythmic, systolic noise at the apex. Heart rate – 94 / min., no pulse deficiency. BP – 130/85 mm. Rt. Century. The ECG is presented below. What arrhythmia occurs, the development of what fatal clinical situation can be assumed?

Describe the provided ECG. Justify your answer to the problem.

A. Sinoatrial blockade. The development of weakness syndrome of the sinus node.
B. Supraventricular extrasystoles. Paroxysm of supraventricular tachycardia.
C. Passing atrioventricular blockade. Complete atrioventricular blockade.
D. Sinus tachycardia. Paroxysm of atrial fibrillation.
E. Group extrasystoles. Ventricular tachycardia, ventricular fibrillation.

- Give a conclusion on the given ECG. Make a differential diagnosis of arrhythmias. Justify the conclusion.

4. Summing up:
Conducting student assessment, summarizing, announcing the next topic of the lesson.
5. List of recommended literature (main, additional, electronic information resources):
<u>Main:</u>
1. Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.
2. Richard B. Berry MD, Mary H. Wagner MD, in Sleep Medicine Pearls (Third Edition), 2015

Premature Beats.

Additional:
3. John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.
Electronic information resources:
1. http://www.ecgmadesimple.com
2. https://ekg.academy
3. https://www.skillstat.com/tools/ecg-simulator
4. https://ecg.utah.edu

Topic 10
1. Topic: "ECG diagnostics of sinoatrial and intraatrial blocks".
Duration - 4 hours.
Objective: To replicate the causes of conduction disorders, including sinoatrial and intraatrial blocks. Learn to identify ECG signs of sinoatrial and intraatrial blocks.
Basic concepts: conduction disorder, sinoatrial block (SA), intraatrial block.
Equipment: ECG films, slides for demonstration, patients.
Plan:
2. Organizational measures (greeting, checking attendees, communicating the topic, the purpose of the lesson, motivating students to study the topic).
Control of the basic level of knowledge is carried out by the method of frontal questioning. To control the basic level of knowledge, a higher education applicant must know the answers to the following questions:

- What is sinoatrial block?
- The most common causes of sinoatrial block.
- ECG signs of sinoatrial block.
- The difference between ECG signs of sinoatrial block of the II degree of types 1 and 2.
- What is intraatrial (interatrial) block?
- The most common causes of intraatrial block.
- ECG signs of intraatrial block.

3. Formation of professional skills (mastering the skills of electrocardiogram analysis).
*Recommendations (instructions) for completing tasks*
A higher education applicant should be able to:

- Find ECG signs of sinoatrial block of I, II (types 1 and 2) and III.
- Find ECG signs of grade I, II, and III intraatrial block.

*Materials for the final stage of the lesson*
Situational tasks:

4. A 54-year-old woman complains of heart failure, palpitations, decreased ability to work, and general weakness. He has been noting a deterioration in his condition for several months. After a short episode of fainting, she went to the doctor. Objectively: the pulse is 62 in 1 minute,
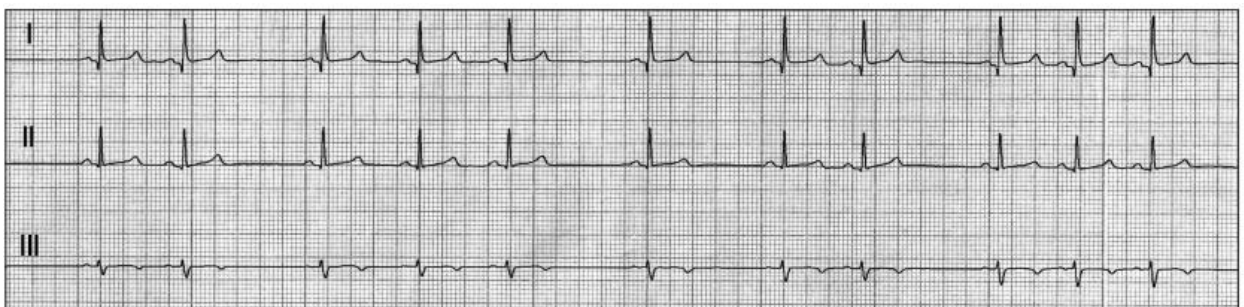
arrhythmic. No murmurs were detected on auscultation. What is the most likely cause of this condition, based on the rhythmogram data?
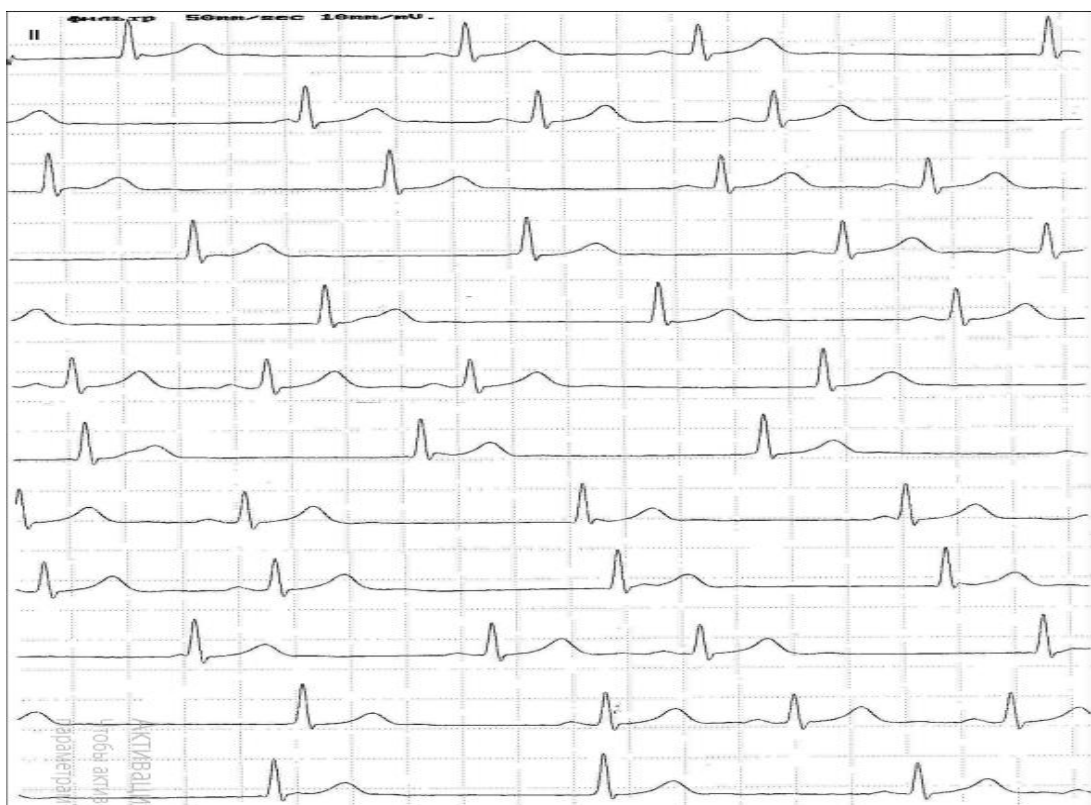
A. SA-blockade of the second century.
B. AV blockade of the first century.
B. AB-blockade of the second century.
D. AV-blockade of the third century.
D. Trifascicular block of the bundle legs of Gis

5. How do you interpret the changes on the ECG below?
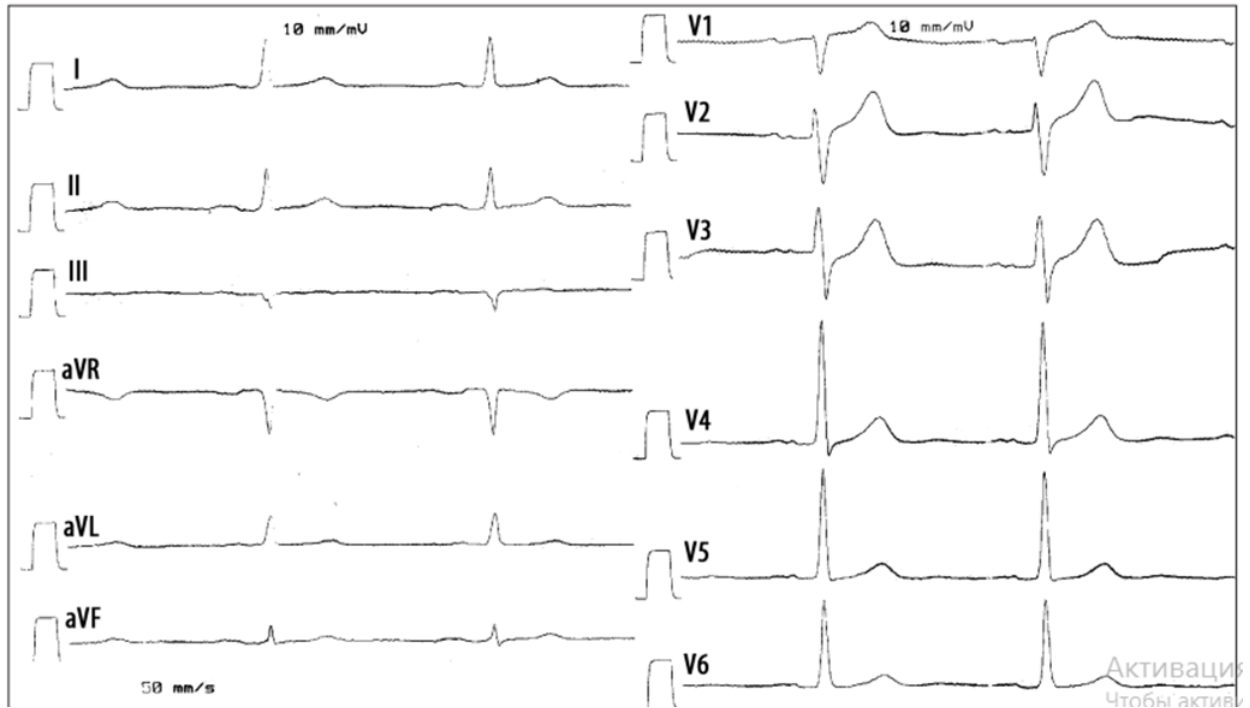
A. Atrial block of the third century.
B. SA-blockade of the first century.
B. Atrial block of the first degree.
D. SA-blockade of the second century.
D. AV-blockade of the second century.

6. How do you interpret the changes in the rhythmogram below?

A. Trifascicular block of bundle legs
B. SA-blockade of the second century.
B. Atrial block of the third century.
D. SA-blockade of the first century.
D. AV-blockade of the second century.

4. Summing up:
Conducting student assessment, summing up, announcing the next topic of the lesson.
5. List of recommended literature (main, additional, electronic information resources):
Main:

1. Hampton D., Edlem D., ECG in practice (translation of the 7th English edition). Kyiv: VSV "Medicine", 2020.-397 p.
2. Richard B. Berry MD, Mary H. Wagner MD, in Sleep Medicine Pearls (Third Edition), 2015
   Premature Beats.

     Additional:
   John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.

Electronic information resources:
1. http://www.ecgmadesimple.com
2. https://ekg.academy
3. https://www.skillstat.com/tools/ecg-simulator
 4. https://ecg.utah.edu
Topic independent work 11.

1. The topic: "ECG - diagnosis of chronic ischemic heart disease".

The duration 4 hours.

Objective: Improve and structure students' knowledge of ECG diagnostics of various forms and possible complications of chronic coronary heart disease, features of performing and evaluating 24-hours ECG monitoring and ECG stress tests for non-invasive assessment of patient risk levels. The ability to decode, interpret and carry out differential diagnostics on the ECG accelerates the accurate detection of lesions in certain parts of the heart, contributes to the formation of electrophysiological thinking.

Basic concepts: hyperacute T wave, flattened T wave, inverted T wave, ST segment depression, ST segment elevation, Holter ECG monitoring, ECG exercise tests.**Equipment**: illustrative material, tables, thematic patients

Plan:

2. Organizational measures (greetings, verification of those present, notification of the topic, purpose of the classes, motivation of higher education students to study the topic).

Control of the reference level of knowledge is carried out by the method of frontal survey. To control the reference level of knowledge, a higher education student should know the answers to the following questions:

1. Classification of chronic forms of CAD.
2. Mechanisms of development of variant angina.
3. ECG signs of myocardial ischemia of various localization.
4. ECG signs of variant angina.
5. Indications for daily ECG monitoring in patients with chronic coronary artery disease.
6. ECG criteria for diagnosing ischemia during daily monitoring.
7. Indications for carrying out ECG stress tests with measured physical load (treadmill test, cycle ergometry).
8. Diagnostic ECG criteria for evaluating the results of stress tests with dosed physical activity.

3. Formation of professional skills (mastering the skills of analyzing electrocardiogram).

*Recommendations (instructions) for performing tasks*

The applicant for higher education should be able to:

1. Decipher the variant of a normal electrocardiogram.
2. To analyze the violation of the repolarization phase on the ECG (ST segment, T waves).
3. Exclude the presence of ECG signs of acute coronary syndrome.
4. To identify signs of cardiac automatism, rhythm and/or conduction disturbances in a patient with chronic coronary artery disease.
5. Evaluate the dynamics of the ECG during 24-hours monitoring and when performing stress tests with dosed physical activity.
6. Formulate a conclusion about specific changes on the ECG.

*Materials for the final stage of the classes*

Situational tasks

1. A 64-year-old patient complains of nausea, chest tightness and shortness of breath after hurriedly walking to work. He looks tired and a little worried, the pulse is rhythmic, 75 in 1 minute. Blood pressure 124/65 mm Hg. The ECG during the attack is presented below. What is the possible localization of myocardial ischemia in the patient?
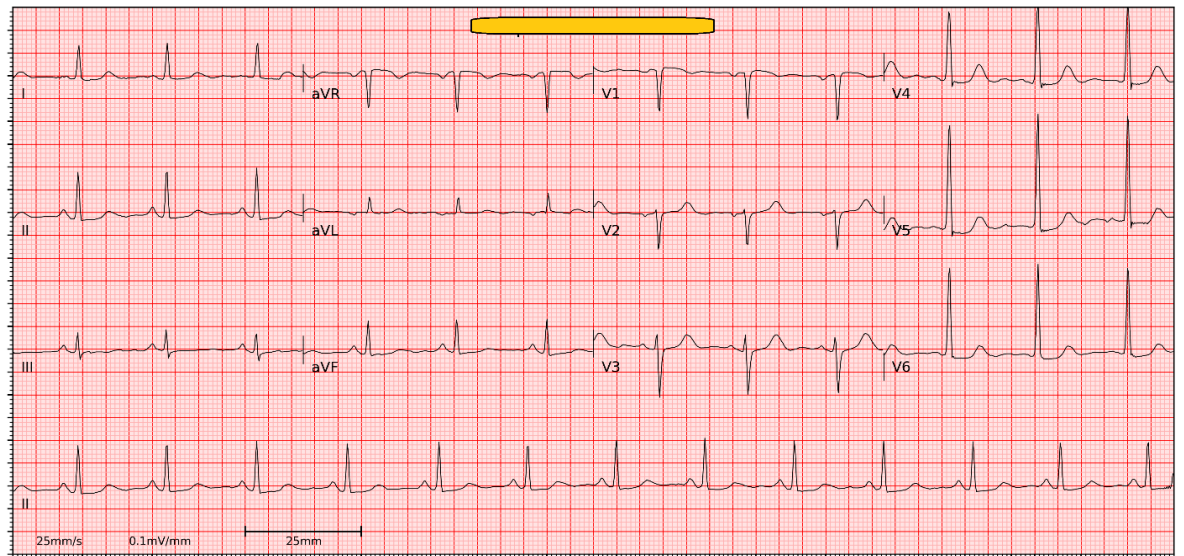
A. Subendocardial ischemia of the right ventricle.
B. Subendocardial ischemia of the front wall of the left ventricle
S. Subendocardial ischemia of the lateral wall of the left ventricle
D. Subepicardial ischemia of the anterior wall of the left ventricle
C. Subepicardial ischemia of the lateral wall of the left ventricle

2. A 68-year-old patient is bothered by chest pain that occurs at rest, usually late in the evening or early in the morning, the pain lasts from 5 to 15 minutes. During heart pain, sweating, palpitations, shortness of breath and dizziness also occur. The patient's ECG in a pain-free state (A) and during a painful episode (B) is presented below. What type of coronary artery disease does the patient have?
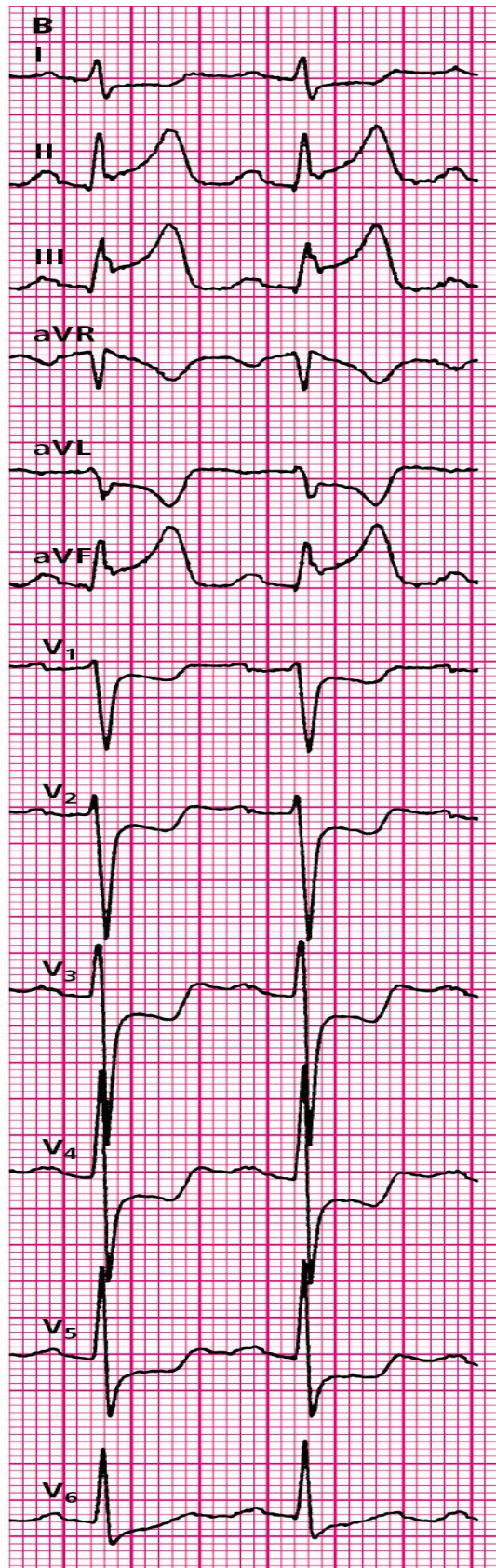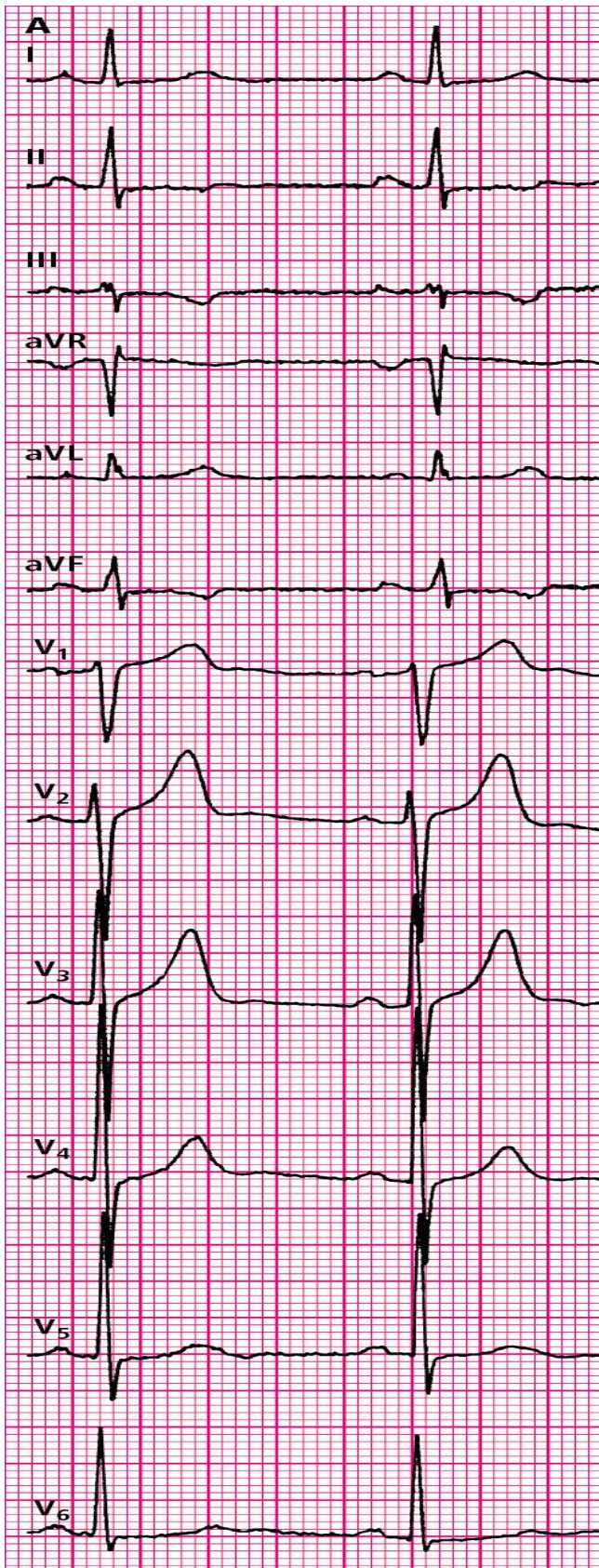
A. Stable angina
B. Unstable angina.
C. Vasospastic angina pectoris.
D. ST segment elevation myocardial infarction.
E. Myocardial infarction without ST segment elevation.

3. A 74-year-old man is bothered by angina attacks when walking fast, when leaving the house to the cold air, sometimes there is shortness of breath, numbness of the left hand. Smokes Father died of a stroke. The doctor compares the ECG at rest (A) and the ECG recorded during an anginal attack. The following signs on the ECG are of diagnostic value:
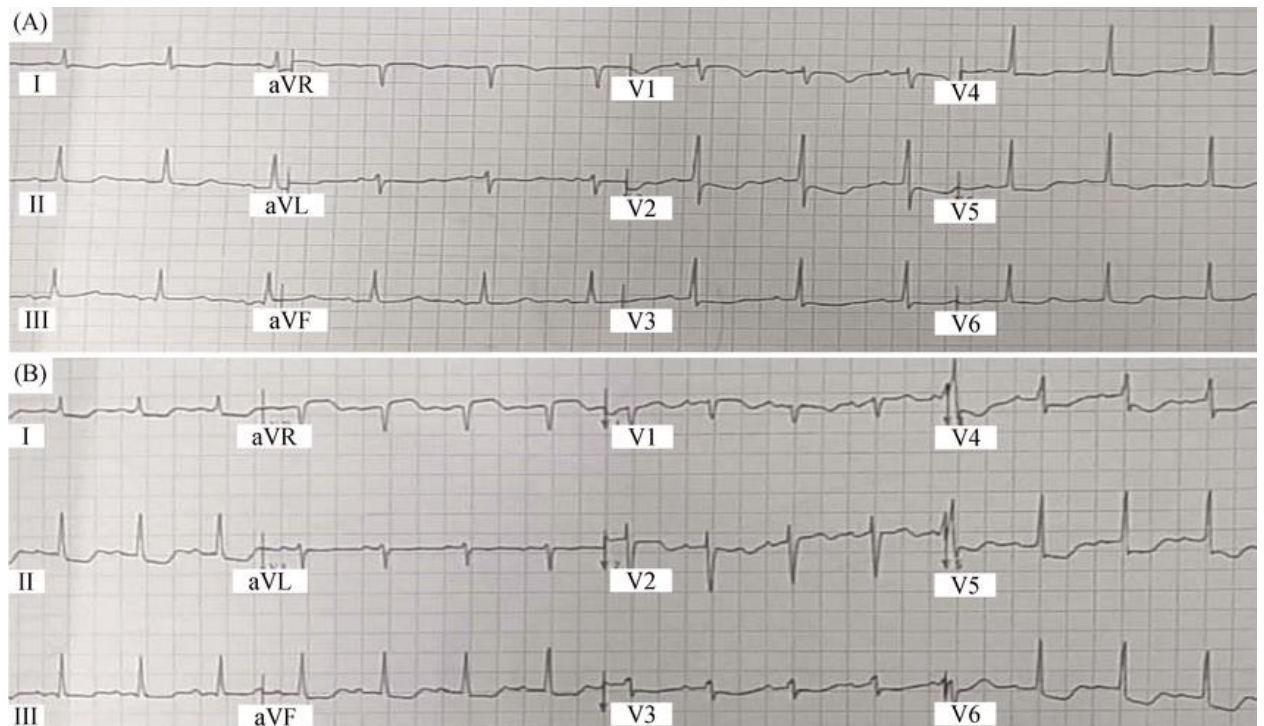
A. Change in heart rate.
B. Widening of the ventricular QRS complex.
C. Deviation from the isoline of the ST segment and changes in the T wave.
D. Depression of the ST segment.
E. Inversion of the T wave.

4. Summing up:
Conducting student assessment, summarizing, announcing the next topic of the lesson.
5. List of recommended literature (main, additional, electronic information resources):
Main:
1. Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.
2. Rautaharju, P, Surawicz, B, Gettes, L. AHA/ACCF/HRS Recommendations for the Standardization and Interpretation of the Electrocardiogram: Part IV: The ST Segment, T and U Waves, and the QT Interval A Scientific Statement From the American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; the American College of Cardiology Foundation; and the Heart Rhythm Society Endorsed by the International Society for Computerized Electrocardiology. J Am Coll Cardiol. 2009 Mar, 53 (11) 982–991. https://doi.org/10.1016/j.jacc.2008.12.014
Additional:
1. de Luna, A. B., Cygankiewicz, I., Baranchuk, A., Fiol, M., Birnbaum, Y., Nikus, K., Goldwasser, D., Garcia-Niebla, J., Sclarovsky, S., Wellens, H., & Breithardt, G. (2014). Prinzmetal angina: ECG changes and clinical considerations: a consensus paper. *ANNALS OF NONINVASIVE ELECTROCARDIOLOGY*, *19*(5), 442-53. https://doi.org/10.1111/anec.12194

Independent work class 13.

1. The topic of the independent work class: "ECG diagnosis in pericarditis, myocarditis".
The duration of the independent work class is 2 hours.

Objective: To improve and structure students' knowledge of ECG - diagnosis of pericarditis of different types, ECG – findings in myocarditis. ECG registration and interpretation of detected changes plays additional role in the diagnosis of myocarditis and pericarditis. At the initial stage of the examination, to provide differential diagnosis, it is necessary to register and interpret an ECG. Depending on the ECG data, different stages of fibrinous pericarditis, types of pericarditis (fibrinous, exudative, cardiac tamponade) can be suspected.

Basic concepts: pericarditis, myocarditis, diffuse ST segment elevation, ST segment depression, PQ segment depression, stages of fibrinous pericarditis, negative T wave, cardiac tamponade.

Equipment: illustrative material, tables, thematic patients

Plan:

2. Organizational measures (greetings, verification of those present, notification of the topic, purpose of the classes, motivation of higher education students to study the topic).

Control of the reference level of knowledge is carried out by the method of frontal survey. To control the reference level of knowledge, a higher education student should know the answers to the following questions:

• Define myocarditis and pericarditis

• ECG criteria of myocarditis and pericarditis

• ECG criteria of cardiac tamponade

• Pathophysiology of ECG changes in myocarditis and pericarditis

• What are the dynamics of ECG changes during fibrinous pericarditis?

3. Formation of professional skills (mastering the skills of analyzing electrocardiogram).

Recommendations (instructions) for performing tasks
The applicant for higher education should be able to:

1. Decipher the variant of a normal electrocardiogram.
2. To analyze the presence of signs of exudative pericarditis, cardiac tamponade on the ECG.
3. Taking into account the clinical course and ECG dynamics, determine the stage of acute fibrinous pericarditis.
4. To analyze the presence of ECG changes in myocarditis.

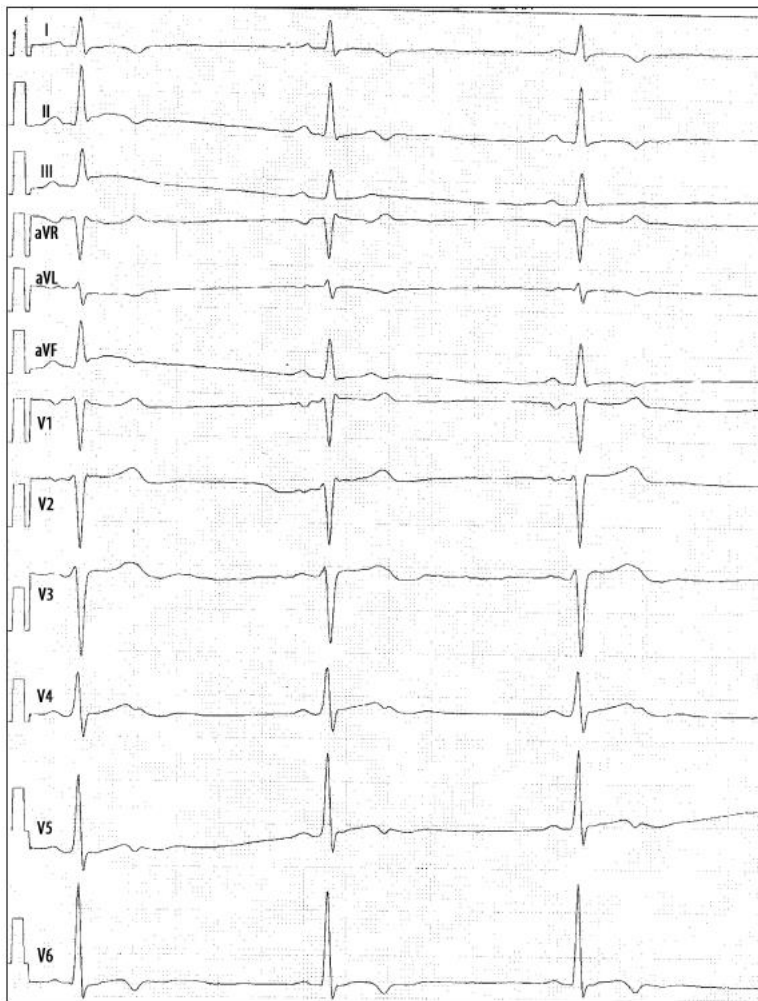*Materials for the final stage of the classes*
Situational tasks
No. 1. A 42-year-old patient complains of palpitations, general weakness, pain in the area of the heart, radiating to the left shoulder, which increases during breathing and decreases, when

the patient sits down; body temperature is 38.5ºC, BP – 105/50 mmHg, heart rate - 114 in 1 minute. A biphasic murmur is heard in the zone of absolute dullness of the heart. Over the lungs, breathing is weakened in the lower parts. On the ECG: concordant elevation of the ST segment in all standard and V2 - V6 chest leads. What is the most likely diagnosis?
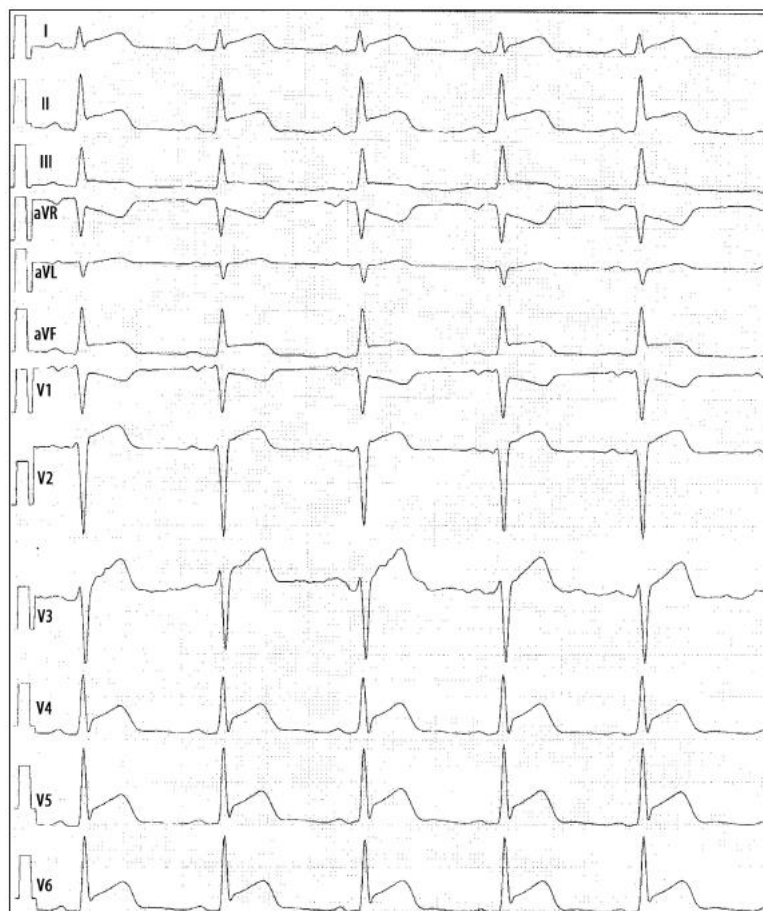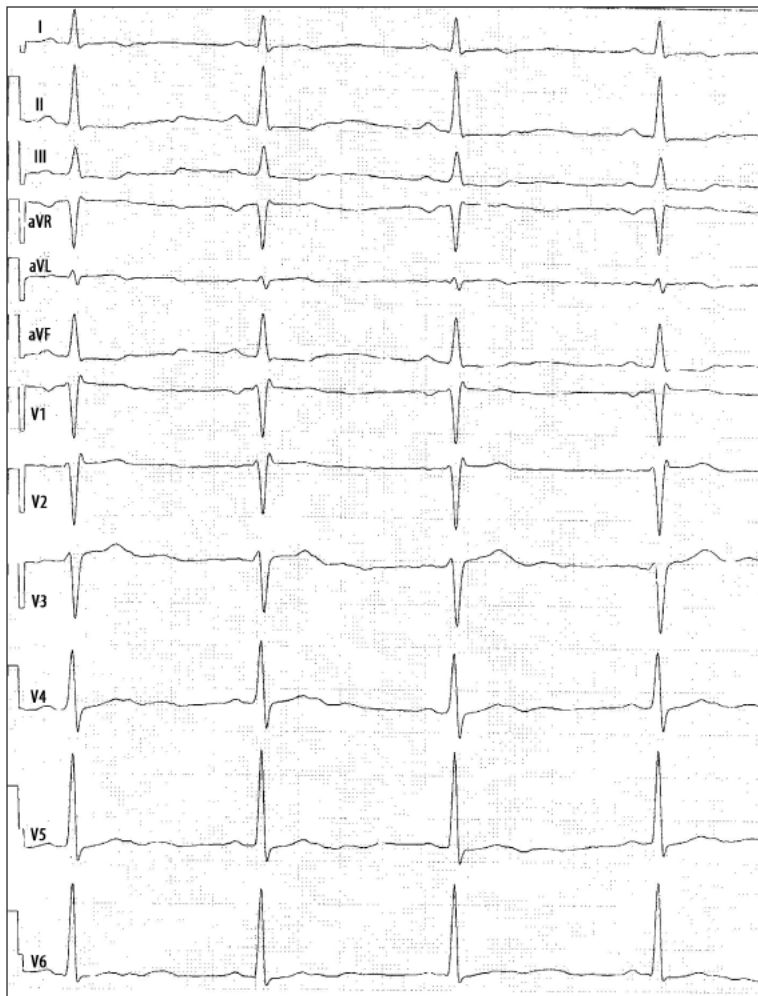

A. Unstable angina pectoris
B. Dissecting aneurysm of the aorta
C. WPW-syndrom
D. Acute pericarditis
E. Penetration of the ulcer

N 2. A 42-year-old patient complains of palpitations, general weakness, pain in the area of the heart, radiating to the left shoulder, which increases during breathing and decreases, when the patient sits down; body temperature is 38.5ºC, BP – 105/50 mmHg, heart rate - 114 in 1 minute. A biphasic murmur is heard in the zone of absolute dullness of the heart. Over the lungs, breathing is weakened in the lower parts. On the previous ECG: concordant elevation of the ST segment in all standard and V2 - V6 chest leads. In three weeks on ECG: the ST segment is almost on the isoline with an upward convexity. The T wave in I, II, aVL, V6 is negative, and in V3-V5 (+/-).What is the most likely diagnosis?

A. Unstable angina pectoris
B. Dissecting aneurysm of the aorta
C. WPW-syndrom
D. positive changes after acute pericarditis
E. Penetration of the ulcer

No. 3. A 42-year-old patient complains of palpitations, general weakness, pain in the area of the heart, radiating to the left shoulder, which increases during breathing and decreases, when the patient sits down; body temperature is 38.5ºC, BP – 105/50 mmHg, heart rate - 114 in 1 minute. A biphasic murmur is heard in the zone of absolute dullness of the heart. Over the lungs, breathing is weakened in the lower parts. On the previous ECG: concordant elevation of the ST segment in all standard and V2 - V6 chest leads. In four weeks on ECG: the ST segment in most leads is on the isoline, in leads II, III, aVF is slightly below the isoline. T wave in I,aVL,V4-V6 (+/-), in II,III,aVF (-/+).What is the most likely diagnosis?

A. Unstable angina pectoris
B. Dissecting aneurysm of the aorta
C. further positive dynamics after transferred pericarditis
D. acute coronary syndrom
E. Penetration of the ulcer

No. 4. A 63-year-old woman developed shortness of breath, which worsens when lying down; tachycardia, hypotension, expansion of the jugular veins, muffled heart sounds. On the ECG, a decrease in the voltage of the QRS complex and fluctuations in its amplitude (electrical alternation) in all leads. What is the most likely diagnosis?
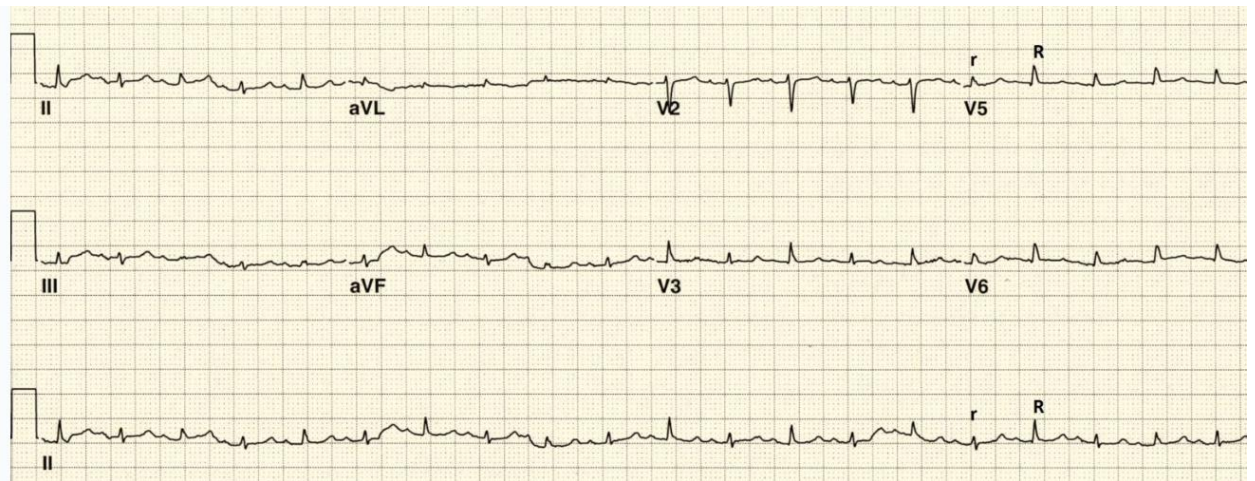
A. Acute anterior myocardial infarction
B. Cardiac tamponade
C. Ventricular tachycardia
D. Stroke
E. A dissecting aneurysm of the aorta

№ 5. A 43-year-old woman developed chills, fever, intense pressing pain in the heart area, palpitations, and shortness of breath 8 days after vaccination against diphtheria. Pulse-100/min, arrhythmic, BP-100/70 mm Hg. Heart sounds are weakened, systolic murmur is heard above the apex, gallop rhythm, extrasystoles are determined. Other organs and systems – without pathological changes. What is the most probable diagnosis of the patient?

A. Widespread Q-MI anterolateral
B. Acute anterolateral MI with ST elevation. Ventricular extrasystole.
C. Common Q-MI posterolateral
D. Acute myocarditis, ventricular extrasystoles

E. Non-Q-MI

4. Summing up:
Conducting student assessment, summarizing, announcing the next topic of the lesson.
5. List of recommended literature (main, additional, electronic information resources):
Main:

1. Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.
2. Richard B. Berry MD, Mary H. Wagner MD, in Sleep Medicine Pearls (Third Edition), 2015 Premature Beats.
3. Functional diagnostics: Textbook for intern doctors and trainee doctors of institutions (faculties) of postgraduate education of the Ministry of Health of Ukraine\ edited by O.H. Zharinova, Yu.A. Ivaniva, V.O. Kutsia – 2nd ed., supplement. and revised. - Kyiv: Chetverta Khvyla, 2021. – 784 p.: illustrations.
4. Zharinov O.Y., Kuts V.O. (editors) Fundamentals of electrocardiography (fourth edition, revised and supplemented). - Kyiv: The Fourth Wave, 2020. - 248 p.
5. Zharinov O.Y., Kuts V.O., Verezhnikova H.P., Serova O.D. Workshop on electrocardiography. - Lviv, 2014. - 268 p.
6. Clinical electrocardiography for professionals \ V.A. Skibchyk, Y. V. Skibchyk. - Lviv: Publisher T.V. Marchenko, 2021. - 568 p.

Additional:
7. John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.
Electronic information resources:
1. http://www.ecgmadesimple.com
2. https://ekg.academy
3. https://www.skillstat.com/tools/ecg-simulator
4. https://ecg.utah.edu
5. Ukrainian portal of functional diagnostics https://fd.org.ua/
6. Dr. Smith`s ECG Blog http://hqmeded-ecg.blogspot.com/

Independent work class 14.

1. The topic of the independent work class: "ECG in case of disturbances of electrolyte metabolism". The duration of the independent work class is 2 hours.
    Objective: ECG changes caused by electrolyte imbalance are a consequence of the effect of pathologically changed concentration of ions on the transmembrane potentials of heart cells. For the interpretation of these changes, it is important to take into account the possibility of combining electrolyte disturbances with basic ECG changes, non-specific consequences of heart rate fluctuations, arrhythmias and intraventricular conduction disturbances with electrolyte imbalance, as well as the mutual influence of electrolytes.
    Basic concepts: hyperkalemia, hypokalemia, hypercalcemia, hypocalcemia.
    Equipment: illustrative material, tables, thematic patients
      Plan:
2. Organizational measures (greetings, verification of those present, notification of the topic, purpose of the classes, motivation of higher education students to study the topic).
    Control of the reference level of knowledge is carried out by the method of frontal survey. To control the reference level of knowledge, a higher education student should

know the answers to the following questions:
• ECG criteria of hyperkalemia.

• ECG criteria of hypokalemia.

• ECG criteria of hypercalcemia.

• ECG criteria of hypocalcemia.

3. Formation of professional skills (mastering the skills of analyzing electrocardiogram).

Recommendations (instructions) for performing tasks
The applicant for higher education should be able to:

5. Decipher the variant of a normal electrocardiogram.
6. To analyze the presence of signs of hyperkalemia on the ECG.
7. To analyze the presence of signs of hypokalemia on the ECG.
8. To analyze the presence of signs of hypercalcemia on the ECG.
9. To analyze the presence of signs of hypocalcemia on the ECG.

Materials for the final stage of the classes
Situational tasks
No. 1. In a 5-year-old child with malabsorption syndrome, changes in the form of depression of the ST segment, inversion of T wave and high U wave were detected on the ECG. Potassium level- 2.6 mmol/l. What are the reasons for such changes?
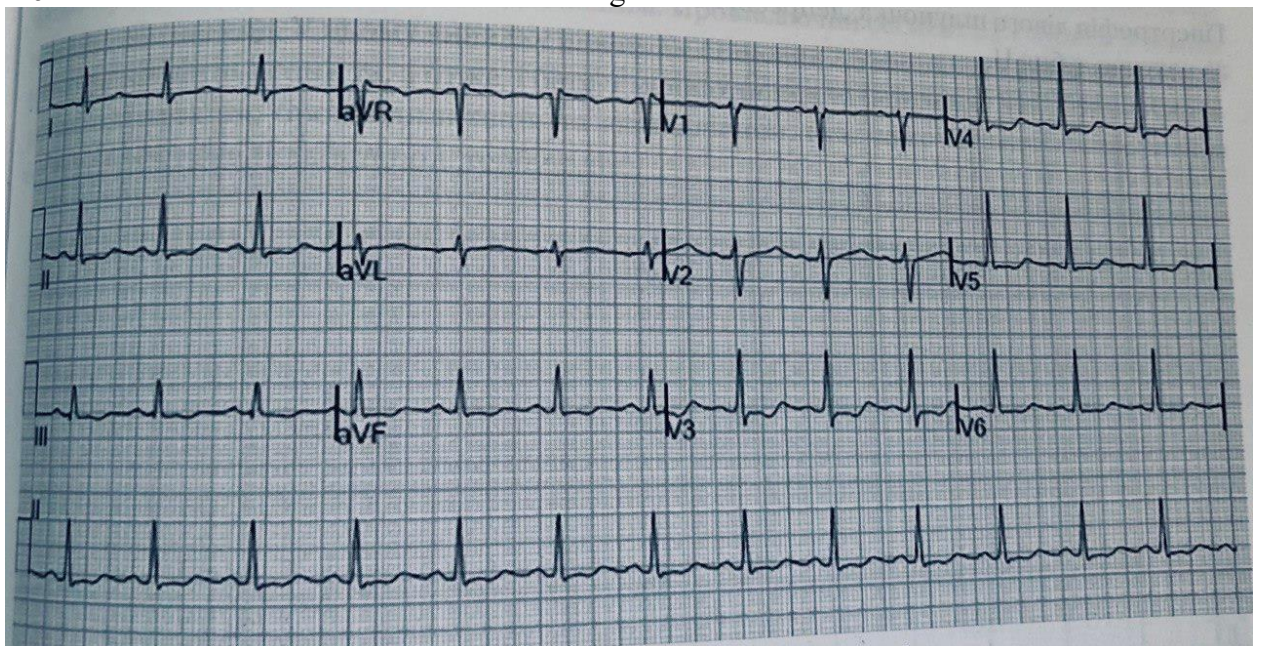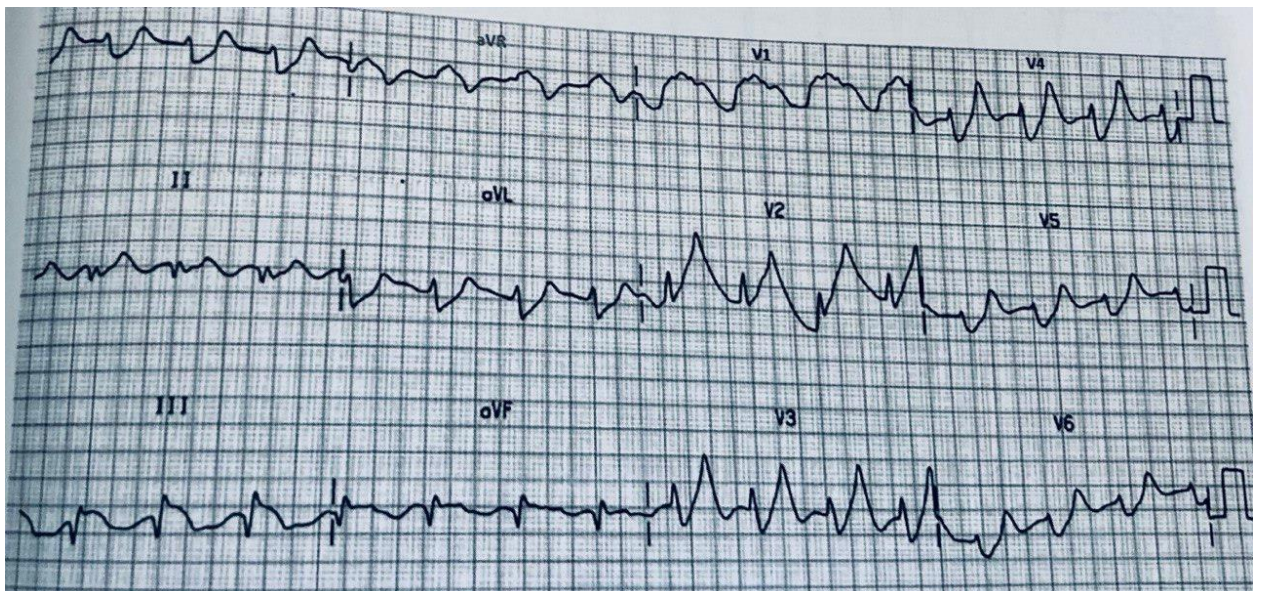

A. Hypokalemia
B. Hypomagnesemia
C. Hypocalcemia
D. Hypercalcemia
E. Hyperkalemia

N 2. A 35-year-old patient, who has been on hemodialysis for the past few years due to chronic glomerulonephritis, developed heart failure, hypotension, increasing weakness, and shortness of breath. On the ECG: high pointed T waves. Potassium level- 7.0 mmol/l. The day before - a gross violation of drinking and dietary regimes. What biochemical changes are the most likely cause of the above clinical picture?
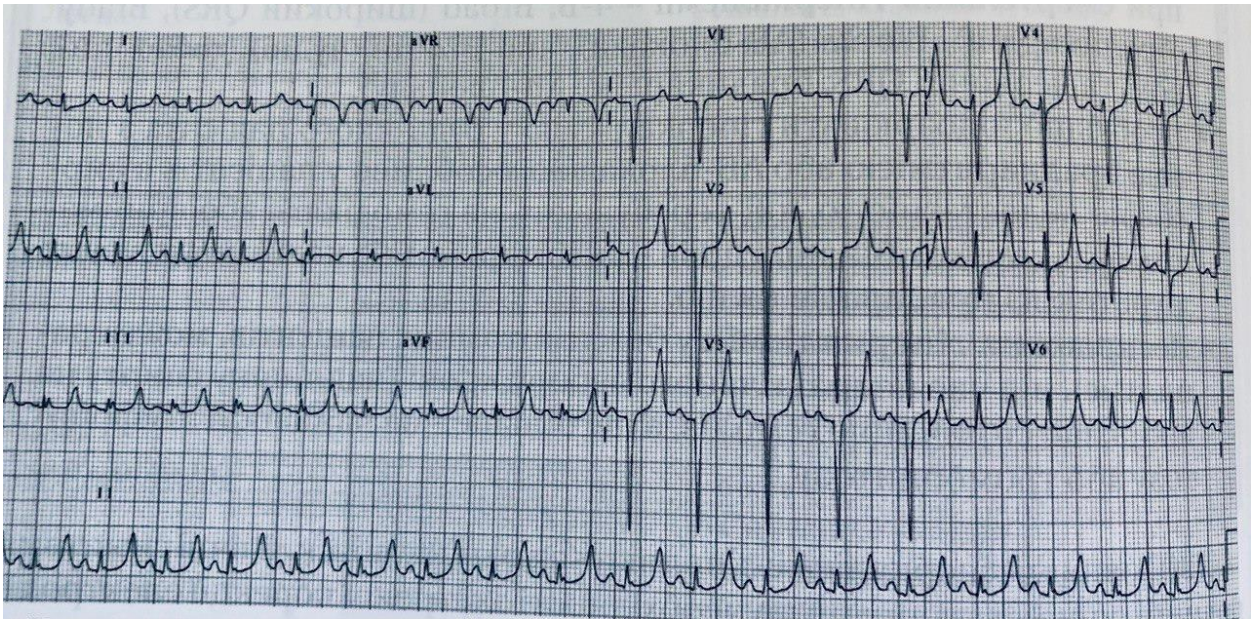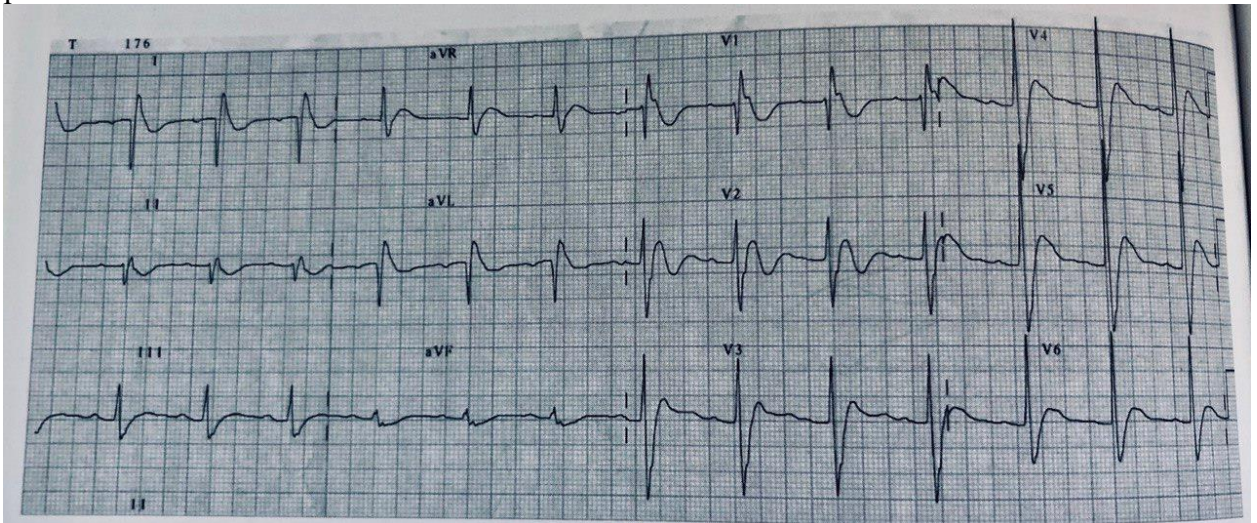
A. Hypocalcemia
B. Hypernatremia
C. Hypokalemia
D. Hyperhydration
E. Hyperkalemia

No. 3. A 35-year-old patient, who has been on hemodialysis for the past few years due to chronic glomerulonephritis, developed heart failure, hypotension, increasing weakness, and shortness of breath. On the ECG: extended deformed QRS complexes, absence of P wave, undefined rhythm. Potassium level- 8.9 mmol/l. The day before - a gross violation of drinking and dietary regimes. What biochemical changes are the most likely cause of the above clinical picture?
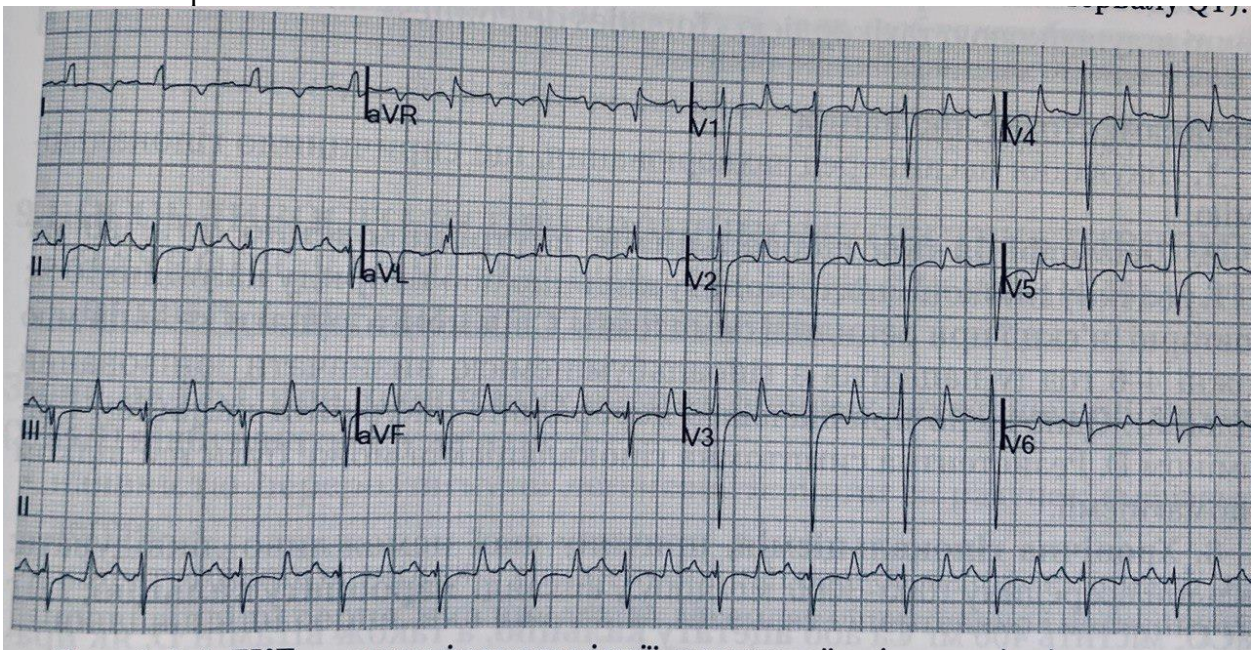

A. Hypocalcemia
B. Hypernatremia
C. Hypokalemia
D. Hyperhydration
E. Hyperkalemia

No. 4. A 41-year-old man with parathyroid adenoma. On the ECG: shortening of the QT interval, a notch on the descending knee of the QRS complex, best seen in lead V1. The level of serum calcium is 6.1 mmol/l. What biochemical changes are the most likely cause of the above clinical picture?

A. Hypercalcemia
B. Hypernatremia
C. Hypokalemia
D. Hypocalcemia
E. Hyperkalemia

№ 5. A patient with diabetic coma and acute renal failure. On the ECG, there are narrow peak T waves and a prolonged QT interval. What biochemical changes are the most likely cause of the above clinical picture?

A. Hypercalcemia, hypokalemia
B. Hypernatremia, hypokalemia
C. Hyperkalemia, hypocalcemia

D. Hypocalcemia, hypokalemia

E. Hypercalcemia, hypernatremia

4. Summing up:

Conducting student assessment, summarizing, announcing the next topic of the lesson.

5. List of recommended literature (main, additional, electronic information resources):

<u>Main:</u>

1. Frank A. Fish, Prince J. Kannankeril, and James A. Johns Disorders of Cardiac Rhythm https://doi.org/10.1016/B978-0-323-07307-3.10028-X.

2. Richard B. Berry MD, Mary H. Wagner MD, in <u>Sleep Medicine Pearls (Third Edition)</u>, 2015 Premature Beats.

3. Functional diagnostics: Textbook for intern doctors and trainee doctors of institutions (faculties) of postgraduate education of the Ministry of Health of Ukraine\ edited by O.H. Zharinova, Yu.A. Ivaniva, V.O. Kutsia – 2nd ed., supplement. and revised. - Kyiv: Chetverta Khvyla, 2021. – 784 p.: illustrations.

4. Zharinov O.Y., Kuts V.O. (editors) Fundamentals of electrocardiography (fourth edition, revised and supplemented). - Kyiv: The Fourth Wave, 2020. - 248 p.

5. Zharinov O.Y., Kuts V.O., Verezhnikova H.P., Serova O.D. Workshop on electrocardiography. - Lviv, 2014. - 268 p.

6. Clinical electrocardiography for professionals \ V.A. Skibchyk, Y. V. Skibchyk. - Lviv: Publisher T.V. Marchenko, 2021. - 568 p.

<u>Additional:</u>

7. John F. (Barry) Keane, Donald C. Fyler, James E. Nadas' Pediatric Cardiology. 2nd Edition - June 15.

<u>Electronic information resources:</u>

1. http://www.ecgmadesimple.com

2. https://ekg.academy

3. https://www.skillstat.com/tools/ecg-simulator

4. https://ecg.utah.edu

5. Ukrainian portal of functional diagnostics https://fd.org.ua/

6. Dr. Smith`s ECG Blog http://hqmeded-ecg.blogspot.com/

Independent work class 15.

1. The topic of the independent work class: "Features of the ECG in children".

The duration of the independent work class is 2 hours.

    Objective: Violation of heart rhythm and conduction is one of the most complex and relevant sections of pediatric cardiology. For 100,000 live newborns, 4–10 have complete congenital atrioventricular block, and 30% of them have it in combination with various congenital heart defects. Without timely diagnosis and treatment, 50% of these children die before the end of the first year of life.

    Basic concepts: congenital heart defects, age-related features of the ECG, syndromes of pre-excitation.

    Equipment: illustrative material, tables, thematic patients

      Plan:

2. Organizational measures (greetings, verification of those present, notification of the topic, purpose of the classes, motivation of higher education students to study the topic).

    Control of the reference level of knowledge is carried out by the method of frontal survey. To control the reference level of knowledge, a higher education student should

know the answers to the following questions:
• Age-related features of the ECG.

• ECG criteria of congenital heart defects.

• ECG criteria of syndromes of pre-excitation.

• Characteristic features of the ECG in some pathological conditions in children.

3. Formation of professional skills (mastering the skills of analyzing electrocardiogram).

Recommendations (instructions) for performing tasks
The applicant for higher education should be able to:

10. To analyze the normal age-related findings on the ECG.
11. To analyze the presence of signs of congenital heart defects on the ECG.
12. To analyze the presence of signs of congenital atrioventricular block on the ECG.
13. To analyze the presence of pathological findings on the ECG in children.

*Materials for the final stage of the classes*
Situational tasks
No. 1. On the ECG of a child of two years old, the heart rate is 110 bpm, dominant R waves in V1-3, pattern RSR' in V1, T wave inversion in V1-3. What pathology does the child have?
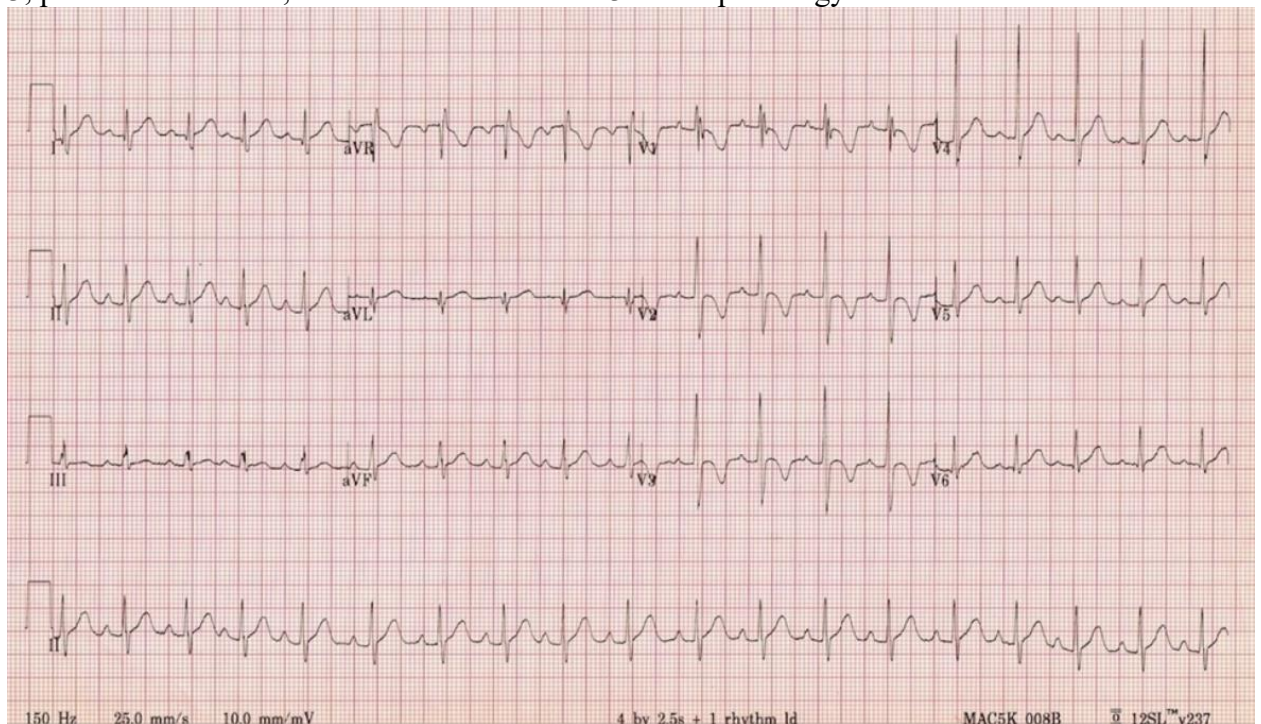

A. Paroxysmal ventricular tachycardia.
B. Paroxysmal supraventricular tachycardia.
C. Atrial flutter.
D. This is a normal findings for a child of this age

N 2. An 8-year-old child was operated for a congenital heart defect (large defect of the interventricular membrane) 6 months ago. During the control examination, had no complaints. On the ECG: sinus rhythm, periodic pauses with the presence of a P wave and loss of the QRST complex are recorded. What complication of the surgical correction had the child?
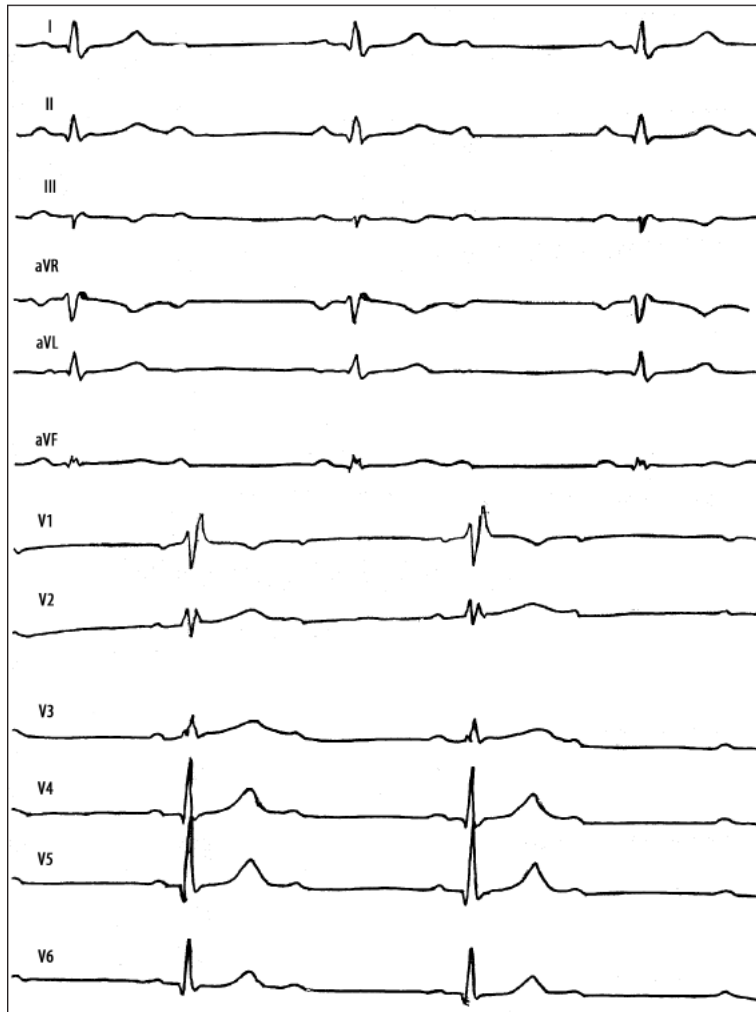
A. Ventricular extrasystole.
B. Atrioventricular block II degree.
C. Sinus node weakness syndrome.
D. Second-degree sinoatrial blockade.
E. Atrial flutter.

No. 3. A 12-year-old girl turned to a cardiorheumatologist for an examination. There are no complaints. It is known from the anamnesis that the girl was operated on for a congenital heart defect (large defect of the interventricular membrane) 2.5 years ago. On the ECG: sinus rhythm, in the first and the second thoracic leads (V1 and V2) a deformed expanded ventricular complex of the rSR type is registered, the T wave is discordant, in the V6 lead the S wave is wide. What complication did the child have?
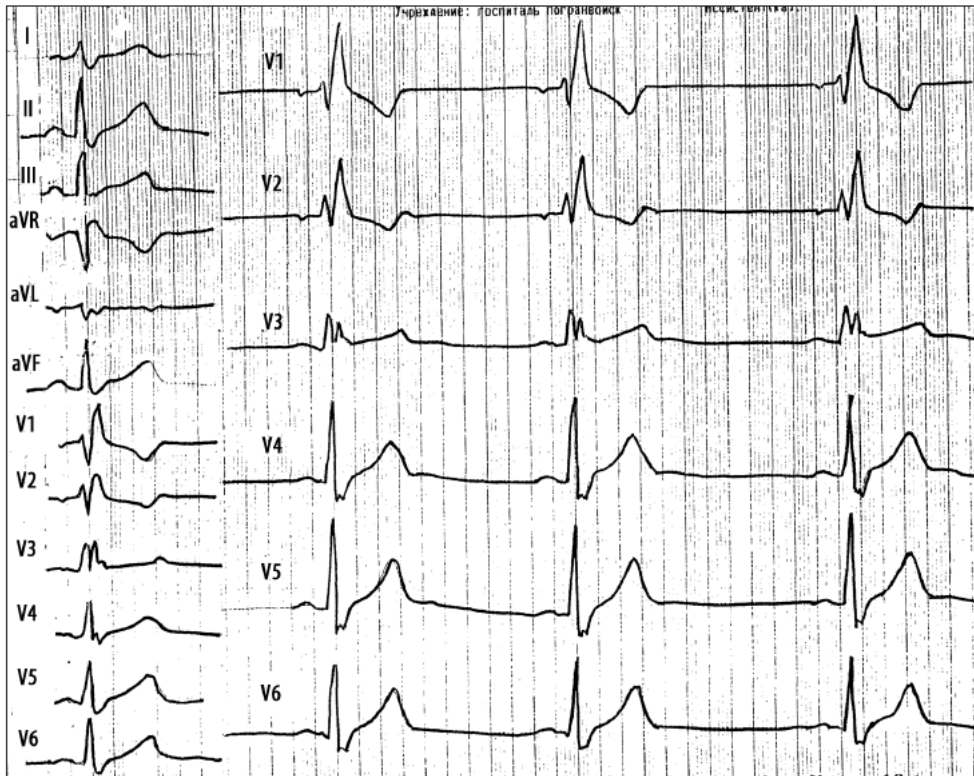
A. Ventricular extrasystole.
B. CLC syndrome.
C. Complete blockade of the left brunch of His bundle.
D. Complete blockade of the right brunch of of His bundle.

No. 4. A 10-year-old girl was brought to the hospital by an ambulance. The child complains of unpleasant sensations in the area of the heart, pain in the epigastric area, dizziness, vomiting. During the external examination, the pronounced pallor of the skin, shortness of breath, and pulsation of the jugular veins attract attention. The heart rate is 206 bpm, the heart sounds are clear. The pulse is small, the blood pressure is 90/70 mm Hg. On the ECG: QRS complexes are supraventricular form, R-R intervals of the same duration, retrograde P waves with an RP' interval of 100 ms. What pathology does the child have?
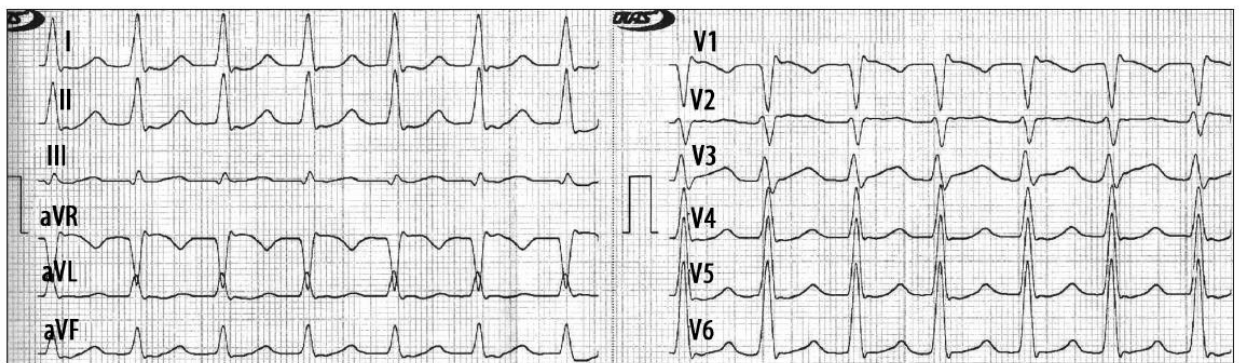

A. Paroxysmal ventricular tachycardia.
B. Paroxysmal supraventricular tachycardia (atrioventricular reciprocal tachycardia)
C. Atrial flutter.

D. This is a normal findings for a child of this age
E. Atrial fibrillation

№ 5. A 10-year-old girl was brought to the hospital by an ambulance. The child complains of unpleasant sensations in the area of the heart, pain in the epigastric area, dizziness, vomiting. During the external examination, the pronounced pallor of the skin, shortness of breath, and pulsation of the jugular veins attract attention. The heart rate is 206 bpm, the heart sounds are clear. The pulse is small, the blood pressure is 90/70 mm Hg. On the ECG, shortly after returning to sinus rhythm: very short PR interval (< 100 ms), slightly elevation of QRS complexes (delta wave).What pathology does the child have?
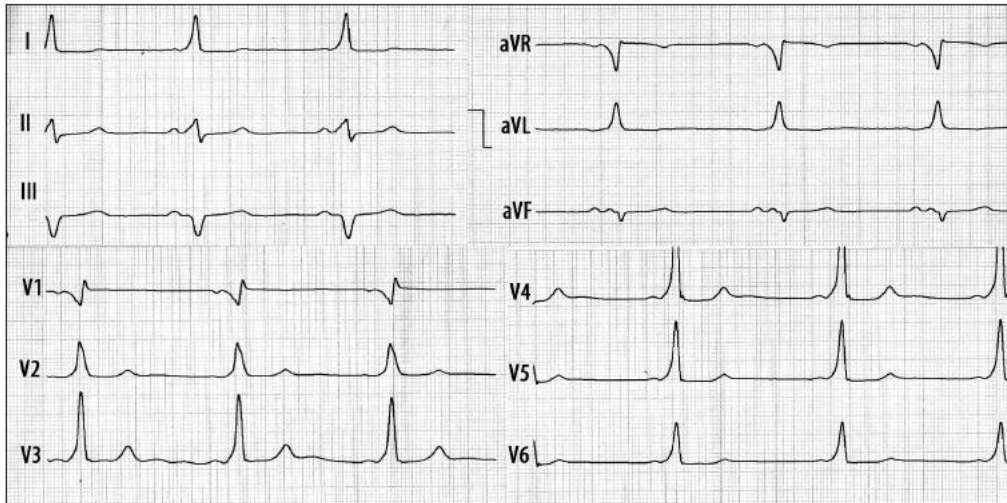
    A. WPW syndrome.
    B. Brugada syndrome
    C. Atrial flutter.
    D. This is a normal findings for a child of this age
    E. Atrial fibrillation

4. Summing up:
Conducting student assessment, summarizing, announcing the next topic of the lesson.
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2. https://ekg.academy
3. https://www.skillstat.com/tools/ecg-simulator
4. https://ecg.utah.edu
5. Ukrainian portal of functional diagnostics https://fd.org.ua/
6. Dr. Smith`s ECG Blog http://hqmeded-ecg.blogspot.com/