

**Federal State Autonomous Educational Institution of Higher Education  
«Peoples' Friendship University of Russia»**

**Medical Institute**

Recommended by ISSC

### **THE WORKING PROGRAM OF THE DISCIPLINE**

**Name of the discipline:** Lab and functional diagnostics

**Recommended for the direction of training / specialty:** 31.06.01 Clinical medicine

**Focus of the program (profile):** 14.01.04 Internal disease: heart failure

**Qualification (degree) of the graduate:** Researcher. Research teacher.

**Form of study:** full-time (3 years)

## 1. Goals and objectives of the discipline:

### Discipline objectives:

Learning goal: mastering in-depth knowledge and acquiring professional competencies in the field of clinical laboratory and functional diagnostics of cardiovascular diseases.

### Discipline objectives:

- improve the professional training of a doctor in cardiology with clinical thinking, well-versed in complex pathology, with in-depth knowledge of related disciplines;
- to develop skills in mastering the latest cardiological techniques in the field of various methods of laboratory and functional diagnostics;
- to prepare a specialist for independent professional treatment and diagnostic activity, who is able to conduct differential diagnostic search;

## 2. Place of discipline in the structure of EP:

The discipline "Lab and functional diagnostics" belongs to the variable part of Block 1, is an optional discipline, read in the 4th semester (4 WE, 144 hours).

In the process of mastering the discipline, the following universal competencies (UC) are formed:

- the ability to plan and solve problems of their own professional and personal development (UC-6).

In the process of mastering the discipline, the following general professional competencies (GPC) are formed:

- the ability and readiness to conduct applied scientific research in the field of biology and medicine (GPC-2);
- the ability and willingness to analyze, generalize and publicly present the results of completed scientific research (GPC-3);
- the ability and readiness to use the laboratory and instrumental base for obtaining scientific data (GPC-5);

In the process of mastering the discipline, the following professional competencies (PC) are formed:

- ability and readiness to analyze, generalize and publicly present the results of scientific research in the field of clinical medicine (PC-2);
- readiness to use laboratory and instrumental base for obtaining scientific data (PC-4);

Table 1 shows the previous and subsequent disciplines aimed at the formation of discipline competencies in accordance with the competence matrix of EP HE.

Table No. 1

### Prior and subsequent disciplines aimed at the formation of competencies

P / p No.	Code and name of competence	Preceding disciplines	Subsequent disciplines (groups of disciplines)
General cultural competences			
1	UC-6	Pedagogics of higher education, Internal medicine, Heart failure	Clinical pharmacology, Practice
General professional competencies			
2	GPC-2	Methodology of scientific research, Internal medicine, Heart failure	Clinical pharmacology, Practice
3	GPC-3	Methodology of scientific research, Internal medicine, Heart failure	Clinical pharmacology , Practice

4	GPC-5	Methodology of scientific research, Internal medicine, Heart failure	Clinical pharmacology / Clinical pharmacology, Practice / Practice
Professional competence			
5	PC-2	Methodology of scientific research, Internal medicine, Heart failure	Clinical pharmacology / Clinical pharmacology, Practice / Practice
6	PC-4	Methodology of scientific research, Internal medicine, Heart failure	Clinical pharmacology / Clinical pharmacology, Practice / Practice

### 3. Requirements for the results of mastering the discipline:

As a result of studying the discipline, a graduate student must:

#### Know:

- fundamentals of pathomorphology, pathogenesis, based on the principles of evidence-based medicine, standards for diagnosis and treatment of the most common diseases of the cardiovascular, respiratory, digestive, urogenital, musculoskeletal, nervous, immune, endocrine systems;
- clinical informativeness of laboratory studies from the standpoint of evidence-based medicine in the most common diseases of the cardiovascular, respiratory, digestive, genitourinary, hematopoietic, musculoskeletal, nervous, immune, endocrine systems;
- fundamentals of pathogenesis, diagnosis and monitoring of emergency conditions;
- basic modern preanalytical and analytical technologies of clinical laboratory research;
- operating principles and operating rules for the main types of measuring instruments, analyzers and other equipment used in clinical laboratory research;
- factors influencing the results of laboratory research at the preanalytical, analytical and postanalytical stages;
- technology for organizing and conducting intralaboratory and external quality control of clinical laboratory studies;
- the main methods of functional diagnostics used in Therapy;
- norm indicators for the studied methods of functional diagnostics;
- quantitative and qualitative indicators characterizing deviations from the norm;
- morphological and functional changes detected by the methods of functional diagnostics. characteristic for various syndromes and diseases.

#### Be able to:

- organize the work of nursing staff on the collection, storage and transportation of biomaterial for laboratory research;
- work on the most common laboratory express analyzers used in intensive care and intensive care units;
- evaluate the results of quality control of the analytical stage of the research performed;
- to draw up accounting and reporting documentation for clinical laboratory studies, provided for by the current regulatory documents;
- assess the clinical significance of laboratory test results,
- determine the need for additional examination of the patient, propose a program for additional examination of the patient;
- analyze the discrepancy between laboratory diagnosis and clinical and pathological anatomical diagnoses, identify errors and develop measures to improve the quality of diagnostic work;
- draw up a plan for laboratory examination of the patient at the stage of prevention, diagnosis and treatment;

- use the methods of functional diagnostics in clinical practice;
- draw up and substantiate a plan for the use of functional diagnostics methods for patients with therapeutic pathology;
- interpret the received data;
- to compare the results obtained using the methods of functional diagnostics with the clinical picture of the patient's disease.

**Own:**

- technology for performing laboratory express tests;
- the technology of organizing and performing quality control of laboratory express tests in the intensive care and intensive care units;
- methods of drawing up a plan for laboratory examination of patients and interpreting the results of laboratory tests at the stages of prevention, diagnosis and treatment of diseases
- the technology of interaction with the personnel of laboratory departments on issues of laboratory examination of patients;
- a methodology for assessing the evidence of clinical laboratory diagnostics presented in scientific and practical publications;
- knowledge about the clinical possibilities of the studied methods of functional diagnostics;
- rules for the preparation and conduct of functional diagnostic research used for diagnostic, therapeutic and prophylactic purposes;
- knowledge of the causes, mechanisms of development and manifestation of pathological processes, revealed by the methods of functional diagnostics in therapeutic practice.

**4. Scope of discipline and types of educational work**

The total workload of the course is 4 credit points.

No.	Type of study load	Total hours
<b>one.</b>	<b>Auditory lessons</b>	<b>18</b>
	Including:	
<b>1.1</b>	Lectures	6
<b>1.2</b>	Other occupations	
	<i>Including</i>	
<b>1.2.1</b>	Practical lessons (PZ)	12
<b>1.2.2</b>	Seminars (C)	
<b>1.2.3</b>	Laboratory exercises (LZ)	
	Of these, in an interactive form (IF)	
<b>2.</b>	<b>Independent work of graduate students (academic hours)</b>	<b>126</b>
	<i>Including:</i>	
<b>2.1</b>	Course project (work)	
<b>2.2</b>	Calculation and graphic works	
<b>2.3</b>	abstract	
<b>2.4</b>	Preparation and passing of interim / final certification	27
	<i>Other types of independent work</i>	
<b>3.</b>	<b>Total labor intensity (academic hours)</b>	<b>144</b>
	<b>Total labor intensity (credit units)</b>	<b>4</b>

## 5. Content of the discipline

### 5.1 Content of discipline sections

No. p / p	The name of the discipline section	Section Contents
1	Stages of laboratory research	Pre-analytical stage of laboratory research, responsible parties. Rules for preparing a patient for various types of laboratory tests. Rules for collecting one-time and daily urine. Preparing the patient for blood tests. types of containers for collecting biomaterial. biomaterial labeling. Transportation and storage of biomaterial. Analytical stage of laboratory research. Post-analytical stage of laboratory research. The main sources of errors at the pre-analytical, analytical and post-analytical stages.
2	Laboratory research in cardiology	Laboratory tests for ischemic heart disease. Laboratory diagnostics of myocardial infarction. Troponins. Highly sensitive troponin measurement methods. Algorithms for evaluating research for troponins. Heart enzymes. Whey enzymes. Studies of the hemostatic system in coronary heart disease. Laboratory tests for peripheral arterial disease. Laboratory tests for rheumatic heart disease. Laboratory tests for deep vein thrombosis. Laboratory diagnostics of pulmonary embolism. The influence of drugs used in the treatment of diseases of the cardiovascular system on the results of laboratory parameters.
3	Non-invasive diagnostics of cardiovascular diseases	ECG, principles of performance, indications and contraindications, interpretation of results. Daily ECG monitoring, interpretation of results. 24-hour blood pressure monitoring. Stress tests for coronary insufficiency (bicycle ergometry, treadmill test, transesophageal pacing, stress echocardiography), principle of performance, indications and contraindications, interpretation of results. Complications during the performance of non-invasive diagnostic methods and methods of dealing with them.
4	Univariate echocardiography (M mode). Two-dimensional echocardiography (2D mode).	Principles of obtaining an image of the heart in M mode. Anatomical structures of the sagittal section of the heart. Understand the standard EchoCG positions of the M mode. Principles of obtaining an image of the heart in 2D mode. Standard 2D mode accesses. Doppler ultrasonography. Continuous wave (CW) and pulsed wave (PW) Doppler studies. Fourier transform. Color Doppler mapping.
5	3D mode. 4D mode. Tissue dopplerography. Transesophageal echocardiography. Contrast echocardiography.	Basic hemodynamic measurements. Left ventricular systolic and diastolic dysfunction. EchoCG diagnostics of acquired heart defects, protracted septic endocarditis, cardiomyopathies, heart tumors, pericarditis, congenital heart defects, diagnostics of coronary artery disease.

6	Multispiral computed tomography in the diagnosis of cardiovascular diseases. Radionuclide diagnostics of cardiovascular diseases	Basic principles of the method. The principle of construction of the image. Interpretation of images. The principle of 3D reconstruction. Main indications and contraindications. Disadvantages of the method. Scintigraphy. Positron emission tomography. Single-photon emission tomography. The principle of implementation of the methods. Interpretation of images. Indications and contraindications. Complications when performing these methods and how to prevent them.

## 5.2. Section of disciplines and types of classes

No. p / p	Name section	Lectures	Practical exercises and laboratory work			CPC	Total
			PZ	LR	Including in IF		
IV semester							
1	Stages of laboratory research	1	2			21	24
2	Laboratory research in cardiology	1	2			21	24
3	Non-invasive diagnostics of cardiovascular diseases	1	2			21	24
4	Univariate echocardiography (M mode). Two-dimensional echocardiography (2D mode).	1	2			21	24
5	3D mode. 4D mode. Tissue dopplerography. Transesophageal echocardiography. Contrast echocardiography.	1	2			21	24
6	Multispiral computed tomography in the diagnosis of cardiovascular diseases. Radionuclide diagnostics of cardiovascular diseases	1	2			21	24
<b>TOTAL</b>		<b>6</b>	<b>12</b>			<b>126</b>	<b>144</b>

## 6. Practical lessons (seminars)

No. p / p	Discipline section	Practical training topics (seminars)	Labor intensity (hours)
1	Stages of laboratory research	Preanalytical stage of laboratory research Rules for preparing a patient for various types of laboratory tests The main sources of errors at the pre-analytical, analytical and post-analytical stages	2
2	Laboratory research in cardiology	Laboratory diagnostics of myocardial infarction Studies of the hemostasis system The effect of drugs on laboratory results	2

3	Non-invasive diagnostics of cardiovascular diseases	ECG, 24-hour ECG monitoring, stress tests for coronary insufficiency (bicycle ergometry, treadmill test, transesophageal pacing, stress echocardiography).	2
4	Univariate echocardiography (M mode). Two-dimensional echocardiography (2D mode).	Univariate echocardiography (M mode). Two-dimensional echocardiography (2D mode).	2
5	3D mode. 4D mode. Tissue dopplerography. Transesophageal echocardiography. Contrast echocardiography.	3D mode. 4D mode. Tissue dopplerography. Transesophageal echocardiography. Contrast echocardiography.	2
6	Multispiral computed tomography in the diagnosis of cardiovascular diseases. Radionuclide diagnostics of cardiovascular diseases	Radionuclide diagnostics of cardiovascular diseases Scintigraphy. Positron emission tomography. Single-photon emission tomography.	2
Total			12

### 7. Material and technical support of the discipline:

P / p No.	Department name	Name of special * rooms and rooms for independent work	Name of benefits, equipment
1.	<b>Department of Internal Medicine with a course of cardiology and functional diagnostics named after V.S. Moiseeva</b>	Moscow, st. Vavilova, 61, GBUZ GKB im. V.V. Vinogradov DZ Moscow " 10 classrooms for 30, a conference hall for 200 training and seating places.	Lecture rooms are equipped with multimedia equipment. The offices are equipped with computers and Internet access, there is a scientific laboratory for genetic research. 1 lecture hall (multimedia projector, screen), 1 lecture room (laptop, LCD plasma screen). ECG rooms, ECHO-cardiology, functional diagnostics laboratory, general clinical laboratory, wards with patients of various therapeutic and cardiological profiles. Sets of specialized furniture, technical means: a dummy for practicing physical examination skills (2 pcs.), A multimedia projector (4 pcs.), A plasma panel (3 pcs.), A laptop (8 pcs.), A tablet (11 pcs.), A personal computer ( 7 pcs), magnetic board. A set of dummies, a set of educational videos and presentations, a set of analog and digital radiographs, tomograms, sonograms, angiograms, educational posters and tables.

### 8. Educational-methodical and informational support of the discipline

### **a) main literature**

1. 1. D. Zipes, P. Libby et al. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, 2-Volume Set, 11th Edition. Elsevier, 2018 .-- 2128.
2. Hurst's The Heart, 14th Edition. V. Fuster, RA Harrington, J. Narula, ZJ Eapen. McGraw-Hill Education, 2017 .-- 2208
3. Heart Failure: A Companion to Braunwald's Heart Disease, 3th Edition. D. Mann, GM Felker. Saunders, 2015 .-- 784
4. Harrison's Principles of Internal Medicine, 20th Edition. D. Kasper, AS Fauci, SL Hauser, DL Longo, JL Jameson, J. Loscalzo. McGraw-Hill Education / Medical, 2018.
5. Davidson's Principles and Practice of Medicine, 23th Edition. SH Ralston, ID Penman, M. W. J. Strachan. Elsevier, 2018 .-- 1440
6. Feigenbaum's Echocardiography. 8th Edition. WF Armstrong, T. Ryan. Wolters Kluwer. 2018 .-- 2841.
7. Evidence-Based Medicine - 5th Edition. S. Straus, P. Glasziou, S. Richardson, B. Haynes. Elsevier, 2018 .-- 336.
8. Moiseev V.S., Moiseev S.V., Kobalava Zh.D .. Heart Diseases. M.: "Medical Information Agency", 2008. -528 p.
9. Guidelines for the diagnosis and treatment of chronic heart failure. European Heart Journal (2008) 22, 1527-1560
10. American College of Cardiology / European Society of Cardiology Clinical Expert Consensus Document on Hypertrophic Cardiomyopathy European Heart Journal (2010) 24, 1965-1991
11. Guidelines on Prevention, Diagnosis and Treatment of Infective Endocarditis Executive Summary European Heart Journal (2009) 25, 267-276
12. ACC / AHA / ESC guidelines for the management of patients with atrial fibrillation. European Heart Journal (2010) 22, 1852-1923
13. Guidelines on diagnosis and treatment of pulmonary arterial hypertension European Heart Journal (2010) 25, 2243–2278
14. Cardiomyopathy and myocarditis / V.S.Moiseev. - M.: GEOTAR-Media, 2012 .-- 352 p.
15. Acute heart failure / V. S. Moiseev. - M.: Medical Information Agency, 2012 .-- 328 p.
16. Guidelines for the management of patients with atrial fibrillation. [www. cardiosite.ru](http://www.cardiosite.ru)
17. Expert Consensus Document on the Use of Antiplatelet Agents. European Heart Journal (2014) 25, 166-181
18. Cardiology. National leadership. Edited by E.V. Shlyakhto Geotar-Media. 2015.800 p.
19. ESC Guidelines for the Management of Patients with Infective Endocarditis, 2015. Available on the website:<http://www.scardio.org/guidelines>
20. Fundamentals of Internal Medicine. Manual in 2 volumes / ed. V.S. Moiseev, Zh.D. Kobalava, I.V. Maev, A.D. Kaprin, E.I. Gusev, M.V. Shestakova, S.V. Moiseev. 2nd ed., Rev. and add. Moscow. LLC "Medical Information Agency", 2020.
21. VNOK recommendations for the treatment of acute coronary syndrome without persistent ST-segment elevation on ECG. [www. cardiosite.ru](http://www.cardiosite.ru)
22. Recommendations for the diagnosis, treatment and prevention of hypertension in children and adolescents of the All-Russian Scientific Society of Cardiology and the Association of Pediatric Cardiologists of Russia. [www. cardiosite.ru](http://www.cardiosite.ru)
23. Safarova A.F. Echocardiography in various modifications in the assessment of therapeutic interventions for various diseases of the heart and great vessels: Textbook; RUDN Publishing House, 2008 .-- 247 p. ...
24. Ultrasound diagnostics of violations of the morphofunctional state of the myocardium and coronary arteries in various heart diseases: Textbook / Korovina E.P., Safarova A.F. - M.: Publishing house of RUDN, 2008. - 265 p.



25. Echocardiography in various modifications in the assessment of therapeutic interventions for various diseases of the heart and great vessels: Textbook / Safarova AF, Korovina EP; RUDN; - M.: RUDN Publishing House, 2008 .-- 247 p.
26. Korovina E.P. Ultrasound diagnostics of morphological disorders of the large main arteries: Textbook. RUDN Publishing House, 2008 .-- 145 p. Application: CD ROM (Electric resource). - 89.14.

#### **b) additional literature**

1. The ESC Textbook of Cardiovascular Medicine. TF Lüscher, JA Camm, G. Maurer, P. Serruys. Oxford University Press, 2018.
2. Oxford Textbook of Advanced Heart Failure and Cardiac Transplantation - Oxford Medicine. MJ Domanski, MR Mehra, MA Pfeffer. Oxford University Press, 2016 .-- 442.
3. The ESC Textbook of Intensive and Acute Cardiovascular Care. M. Tubaro, P. Vranckx, S. Price, C. Vrints. Oxford University Press, 2015 .-- 799.
4. The EHRA book of Pacemaker, ICD, and CRT Troubleshooting. H. Burri, C. Israel, J.-C. Deharo. Oxford, 2015 .-- 310.
5. The EACVI Textbook of Cardiovascular Imaging. JL Zamorano et al. Oxford University Press, 2015 .-- 678.
6. The ESC Handbook on Cardiovascular Pharmacology. JC Kaski, KP Kjeldsen. Oxford University Press, 2019. -960.
7. How to Read a Paper: The Basics of Evidence-based Medicine and Healthcare, 6th Edition | Trisha Greenhalgh, T. Greenhalgh... Blackwell Bmj Books, 2006 .-- 229.
8. Guidelines for cardiac arrhythmias p / ed. E.I. Chazova. M. 2010.
9. Moiseev V.S., Kiyakbaev G.K. Cardiomyopathies and myocarditis. Moscow, GEOTAR-Media. - 2013. 352s
10. Moiseev V.S., Nikolaev A.Yu., Garmash I.V. Alcoholic disease. Moscow, GEOTAR-Media. - 2014. 480s

#### **c) journals:**

1. Journal of the American College of Cardiology.
2. JACC: Heart Failure.
3. JACC: Cardiovascular Imaging.
4. Circulation.
5. Circulation: Heart Failure.
6. European Heart Journal.
7. European Journal of Heart Failure.
8. European Heart Journal - Cardiovascular Imaging.
9. EP-Europace.
10. JAMA: Cardiology
11. JAMA: Internal Medicine.

#### **Internet resources:**

1. Portal of the All-Russian Scientific Society of Cardiology and the Association of Pediatric Cardiologists of Russia. [http:// www. cardiosite.ru/](http://www.cardiosite.ru/)
2. Portal of the European Association of Cardiology. <http://www.escardio.org/>
3. American Heart Association website. <http://www.heart.org/HEARTORG/>
4. American Heart Association website. [www.acc.org](http://www.acc.org)
5. Electronic library system of RUDN University;
6. RUDN educational portal (<http://web-local.rudn.ru>);
7. Scientific electronic library (<http://elibrary.ru/defaultx.asp>);
8. Universal library ONLINE (<http://biblioclub.ru>);

9. Library of electronic journals BENTHAM OPEN  
(<http://www.benthamscience.com/open/az.htm>);
10. Elsevier Electronic Journal Library (<http://www.elsevier.com/about/open-access/open-archives>)
11. Medical online library MedLib (<http://med-lib.ru/>);
12. Recommendations of the Russian Society of Cardiology [www.scardio.ru](http://www.scardio.ru)
13. US National Library of Medicine National Institutes of Health: <http://www.ncbi.nlm.nih.gov/pubmed/>
14. Scientific electronic library: <http://library.ru/defaultx.asp>

### 9. Methodical instructions for students on mastering the discipline:

In practical classes and lectures in the classroom, the relevant topics are analyzed using multimedia technology (computer, projector). For classes and lectures, presentations prepared in Microsoft PowerPoint are intended. The main purpose of the practical training is to study the methods of laboratory and functional diagnostics of cardiac diseases.

### Independent work of a graduate student

Independent work of graduate students during extracurricular hours can take place as in a computer class, where graduate students can study material on the presentations prepared by the teachers of the department, as well as on computer tests.

As one of the forms of independent work, it is planned to prepare abstracts / abstracts by graduate students in various sections of the course and presentations of reports at the meetings of the department.

### Extracurricular independent work of a postgraduate student includes:

- The study of material on the textbook, teaching aids on paper and electronic media.
- Preparation of an abstract message / presentation on a selected topic.
- Preparation for the execution of tests and test tasks.


### 10. Funds of assessment tools for intermediate certification by discipline

*Materials for assessing the level of mastering the educational material of the discipline "Lab and functional diagnostics" (evaluation materials), including a list of competencies with an indication of the stages of their formation, a description of indicators and criteria for evaluating competencies at various stages of their formation, a description of the assessment scales, standard control tasks or other materials necessary to assess knowledge, skills, skills and (or) experience of activity, characterizing the stages of the formation of competencies in the process of mastering the educational program, methodological materials that determine the procedures for assessing knowledge, skills, skills and (or) experience of activity, characterizing the stages of the formation of competencies, are developed in full and are available for students on the discipline page in the TUIS RUDN.*

**The program has been drawn up in accordance with the requirements of the OS of VO RUDN.**

### Developers:

Associate Professor of Department Internal diseases  
with a course of cardiology and functional  
diagnostics named after V. S. Moiseev  
position, department name

  
signature

E.O.Kotova.  
initials, surname

Head of the Department of Internal diseases

with a course of cardiology and functional  
diagnostics named after V. S. Moiseev  
position, department name

  
signature

Kobalava Zh. D.  
initials, surname

**Program Manager**

Head of the Department of Internal diseases  
with a course of cardiology and functional  
diagnostics named after V. S. Moiseev  
position, department name

  
signature

Kobalava Zh. D.  
initials, surname

**Head of the Department**

Head of the Department of Internal diseases  
with a course of cardiology and functional  
diagnostics named after V. S. Moiseev  
position, department name

  
signature

Kobalava Zh. D.  
initials, surname