Federal State Autonomous Educational Institution of Higher Education

«Peoples' Friendship University of Russia»

Medical Institute

Recommended by MCSD

SYLLABUS
(STUDY GUIDE)

Subject

Pharmacology

Recommended for the direction of training (specialty)

31.05.01 General Medicine

Program (profile, specialization)

General Medicine

1. Aims and objectives of discipline:

The aim of the discipline Pharmacology is to develop in students the system of knowledge about the principles of drugs classification, their mechanisms of action, pharmacological effects, indications and contraindications for use; the principles of combining drugs, the risk of adverse side effects and their prevention, rules of drugs prescription and drug rational administration.

Objectives:

- To study the general laws of the drug influence on the human body: the concept of pharmacokinetics, mechanism of action, pharmacodynamics of drugs, the main and adverse pharmacological effects and their dependence on the physicochemical properties of the active substance, routes of administration, species, age and condition of the animal and other conditions.

-To study classification of substances according to pharmacological groups on the basis of the systematic principle; for each group to study the general characteristics, mechanism of action, effects, indications and contraindications to the use of basic drugs, possible cases of poisoning and first aid measures.

- To know the characteristics of the individual drugs, to know their pharmacokinetic and pharmacodynamic parameters, mechanisms of action, the main and adverse drug effects, indications and contraindications.

2. Discipline position in General practices in High School:

Discipline Pharmacology refers to the basic part of the unit 1 of the curriculum.

Table 1 shows the number of preceding and following disciplines directed on discipline competencies formation in accordance with the matrix of competencies.

Table № 1

Preceding and following disciplines directed on discipline competencies formation

№ п/п	Code and name of the competence	Preceding disciplines	Following disciplines (groups of disciplines)
General professional competences (GPC)			
1	GPC-10	Mathematics Medical informatics Biochemistry	Radiation diagnostics general surgery Medical rehabilitation Faculty surgery Occupational diseases Biostatistics Telemedicine
2	GPC-11	Physics	Hygiene Public health and health care, health economics

3. Requirements for the results of the discipline study:

The process of studying the discipline is aimed on the formation of the following **competences:**

Table 2.
Competences formed by the discipline.

Code	Name	Achievement Indicator Code and Name
GPC-10	Being able to understand the operation principles of modern IT and use them to solve professional tasks	GPC-10.1. Being able to use information technology in professional activity. GPC-10.2 Being able to observe the information security rules in professional activity. GPC-10.3. Being able to use information and communication technologies, including applied software for general and special purposes in dealing with professional tasks.
GPC-11	Being able to prepare and apply scientific, research, development and production, design, organizational, management and regulatory documentation in the healthcare system	GPC-11.1. Being able to prepare scientific, research, development and production, design, organizational, management and regulatory documentation in accordance with the area of professional activity and the current requirements for their execution. GPC-11.2. Being able to apply scientific, research, development and production, design, organizational, management and regulatory documentation within the framework of their professional activities.

As a result of studying the discipline Pharmacology, the student must:
Know:

1. General principles of drug prescriptions.

2. Fundamentals of pharmacodynamics and pharmacokinetics of drugs.

3. Classification and main characteristics of medicines, indications and contraindications, side effects.

Be able to:

1. To analyze the issues of pharmacology and modern theoretical concepts and directions of pharmacology in medicine.

2. Use educational, scientific, popular science literature, the Internet sources to study the discipline of pharmacology.

3. Analyze the action of drugs in terms of their combination of pharmacological properties and the possibility of their use for therapeutic treatment.

4. Write out prescriptions for medicines.

Master:

1. Skills in the preparation of medical documentation (prescriptions for various forms of medicines).

2. Skills in the analysis of pharmacodynamics and pharmacokinetic characteristics of drugs in order to predict side effects and drug interactions.

4. The volume of discipline and types of training work

Total labor content of discipline is 7 credits.

Scope of discipline and types of educational work

Types of educational work	**Total hours**	**Semester**	
		5	6
Auditory lessons	**160**	**86**	**74**
Including:			
Lectures	35	18	17
Practical lessons (PL)	-	-	-
Seminars (S)	-	-	-
Laboratory works (LW)	125	68	57
Independent work (total)	92	58	34
Total labor content			
hours	**252**	**144**	**108**
credits	**7**	**4**	**3**

5. Discipline content

5.1. Sections content

Table 3.

Sections content

№	Name of discipline section	№ of theme	Section content
1	**General Pharmacology**	**Theme 1**	1. **Recipe. Introduction to Pharmacology.** Types of prescriptions. Formulation rules in the Russian Federation. Types of dosage forms. ATC classification.
		Theme 2	**2. Basic principles of pharmacodynamics** Mechanisms of drug action. Antagonists, agonists, partial agonists. Target molecules of drugs (receptors, enzymes, ion channels). Types of pharmacological response: expected pharmacological response, hyperreactivity, tachyphylaxis, idiosyncrasy. The relationship between pharmacokinetics and pharmacodynamics. The concept of a therapeutic index, a therapeutic range. Therapeutic drug monitoring (indications, significance, interpretation of results). Pharmacodynamic interaction of drugs.
		Theme 3	**3. Basic principles of pharmacokinetics.** Basic pharmacokinetic parameters and their significance. Drug bioavailability, drug absorption pathways, drug distribution volume, degree of binding to blood plasma proteins, drug metabolism, drug elimination, half-life, drug excretion routes, clearance. Factors affecting the value of pharmacokinetic parameters. Pharmacokinetic curve. Pharmacokinetic interaction of drugs.
2.	**Medicines affecting afferent and efferent innervation**	**Theme1**	**1. Drugs affecting afferent innervation. Local anesthetics.** Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Application in special categories of patients.
		Theme 2	**2. Cholinergic agents. Anticholinergics. Cholinomimetics.** Classification. Pharmacodynamics of groups of drugs, mechanism of action. Pharmacokinetic parameters of drug groups. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients.

		Theme 3	**3. Adrenomimetics and sympathomimetics** Classification. Pharmacodynamics of groups of drugs, mechanism of action. Pharmacokinetic parameters of drug groups. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients.
		Theme 4	**4. Adrenolythics and sympatholytics.** Classification. Pharmacodynamics of groups of drugs, mechanism of action. Pharmacokinetic parameters of drug groups. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients.
3.	**Medicines affecting the cardiovascular system**	**Theme 1**	**1. Diuretics.** Carbonic anhydrase inhibitors (acetazolamide). Osmodiuretics (mannitol). Loop diuretics (bumetamide, furosemide, ethacrynic acid, torasemide). Diuretics acting on the cortical segment of Henle's loop (hydrochlorothiazide, clopamide, chlorthalidone, metolazone, indapamide). Potassium-sparing diuretics (spironolactone, eplerenone, amiloride, triamterene). Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Application in special categories of patients.
		Theme 2	**2. Lipid-lowering agents** Statins (fluvastatin, simvastatin, pravastatin, atorvastatin, rosuvastatin); fibrates (clofibrate, bezafibrate, gemfibrozil); derivatives of nicotinic acid (niacin, enduracin); bile acid sequestrants (cholestyramine, colestipol, colesevelam); an inhibitor of intestinal cholesterol absorption (ezetimibe). Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Application in special categories of patients.

		Theme 3	**2. Antihypertensive drugs** Pathways to affect the renin-angiotensin system (RAS): pharmacology of ACE inhibitors (captopril, enalapril, perindopril, quinapril, moexipril, ramipril, fosinopril, trandolapril, spirapril, lisinopril) and angiotensin receptor blockers (valsartan, candesartan, losartan). Tactics of prescribing ACE inhibitors and angiotensin receptor blockers in hypertension and CHF. Dihydropyridine calcium antagonists: nifedipine, nimodipine, felodipine, amlodipine: pharmacology and place in the treatment of angina pectoris and hypertension. Centrally acting drugs: alpha2-adrenergic agonists (methyldopa, guanfacine, clonidine) and agonists of I1 - imidazoline receptors. Ganglion blockers: azamethonium bromide (penamine), benzohexonium. Features of use in hypertensive crisis. Nitrates (nitroglycerin, isosorbide dinitrate, isosorbide-5-mononitrate, molsidomine): pharmacology, place in the treatment of coronary artery disease. The main difficulties of nitrate therapy (tolerance and ways to overcome it).
		Theme 4	**4. Antianginal drugs** 1) reducing myocardial oxygen demand (b-blockers); 2) increasing the delivery of oxygen to the heart (coronary dilators of the myotropic antispasmodic and adenosine type of action); 3) reducing myocardial oxygen demand and increasing oxygen delivery to the heart (nitrates, calcium antagonists). Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Application in special categories of patients.
		Theme 5	**5. Antiarrhythmic drugs.** Class I antiarrhythmic drugs (sodium channel blockers). Subclasses Ia (quinidine, novocainamide, disopyramide, aymaline), Ib (lidocaine, mexiletine, trimecaine, diphenin), Ic (etmozine, etacizin, propafenone, flecainide,

			alapenin) - clinical pharmacology, indications for prescription, changes in ECG during treatment. Class II antiarrhythmic drugs: Beta-blockers: nonselective (propranolol, nadolol, sotalol), selective (oxprenolol, metoprolol, atenolol, betaxolol, bisoprolol, nebivolol), drugs with their own sympathomimetic activity (oxprenolol, pindolokirol-1), drugs with alpha-1-blocking activity (labetalol, carvedilol). Beta-blockers as myocardial unloading instruments in the treatment of CHF. Class III antiarrhythmic drugs (potassium channel blockers - amiodarone, sotalol, dofetilide, ibutilide): clinical pharmacology, indications for prescription, ECG changes while prescribing these drugs. Class IV antiarrhythmic drugs (calcium antagonists - verapamil, diltiazem): clinical pharmacology, indications for prescription, ECG changes while prescribing these drugs. Antiarrhythmic drugs: adenosine, potassium salts.
		Theme 6	**6. Drugs used in heart failure** Drugs with a positive inotropic effect: cardiac glycosides (digoxin, strophanthin), non-glycoside cardiotonics (dopamine, dobutamine, amrinone, milrinone, enoximone, levosimendan). The dosage regimen of cardiac glycosides, depending on the state of the gastrointestinal tract, metabolic and excretion organs in the patient, the number and rhythm of heart contractions, the state of contractility and conductivity of the myocardium, the rate of development of the effect, drug interactions and factors contributing to a change in sensitivity to drugs. Diagnostics, correction and prevention of adverse reactions. Possible interactions with their combined appointment and with drugs from other groups.
4.	**Medicines affecting hemostasis and hematopoiesis**	**Theme 1**	**1. Drugs affecting the blood coagulation system.** Antiplatelet agents: acetylsalicylic acid, clopidogrel, ticlopidine, abciximab, anagrelide, alprostadil, lysine acetylsalicylate. Direct anticoagulants: sodium heparin, low molecular weight heparins (sodium enoxaparin, nadroparin, fraxiparin). Indirect anticoagulants: warfarin, coumarins. Fibrinolytics: streptokinase, tissue plasminogen activator (alteplase, prourokinase).

			Synthetic selective inhibitor of activated factor X (Xa) fondaparinux sodium, rivaroxaban, direct thrombin inhibitor dabigatran. Drugs that increase blood clotting (vitamin K and its analogs, thrombin, hemostatic sponge, fibrinogen). Fibrinolysis inhibitors (aminocaproic acid). Means for stopping bleeding in patients with hemophilia (factor VIII cryoprecipitate, antihemophilic plasma, coagulation factor VII, coagulation factor IX). Etamsilat. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interactions. Use in special categories of patients.
		Theme 2	**1. Drugs affecting the hematopoietic system.** Iron preparations. Erythropoietin. Preparations containing folic acid, cyanocobalamin. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Application in special categories of patients.
5.	**Medicines affecting the functions of the respiratory system, digestion and metabolic processes**	**Theme 1**	**1. Drugs affecting the functions of the respiratory system** Beta-2 adreno-agonists: salbutamol, fenoterol, salmeterol, formoterol. M-anticholinergics: ipratropium bromide, tiotropium bromide. Methylxanthines: theophylline, aminophylline. Mast cell membrane stabilizers (cromoglycic acid), antileukotriene drugs (zafirlukast, montelukast, zileuton). Inhalation GCS. Systemic GCS. Antitussive drugs. Mucolytics, mucoregulators, mucokinetics. Antitussive drugs of central action. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Application in special categories of patients. The concept of stepwise therapy for bronchial asthma and chronic obstructive pulmonary disease. Diagnostics, correction and prevention of adverse reactions. Receptor desensitization syndrome (tachyphylaxis, internalization and decreased

			regulation - the development of resistance to beta-adreno-agonists), methods of its correction and prevention.
		Theme 2	**2. Drugs affecting the functions of the digestive system.** Pharmacology of antacids (sodium bicarbonate, calcium carbonate, aluminum hydroxide, aluminum phosphate, magnesium oxide, magnesium hydroxide). Pharmacology of H2-histamine receptor blockers (cimetidine, ranitidine, famotidine, nizatidine, roxatidine). Pharmacology of M-anticholinergics: pirenzipine. Pharmacology of proton pump blockers (omeprazole, esomeprazole, lansoprazole, pantoprazole, rabeprazole). Tactics of prescribing antisecretory agents for the treatment and prevention of gastric ulcer and duodenal ulcer. Pharmacology of prokinetics (metoclopromide, domperidone, ciza-primer, trimebutin). Pharmacology of gastrocytoprotectors (bismuth tripotassium citrate, bismuth colloidal subcitrate, misoprostol, sucralfate). Tactics of prescribing antisecretory agents and prokinetics for the treatment and prevention of GERD, functional dyspepsia, NSAID gastropathy. Antibacterial (anti-Helicobacter) drugs in the treatment of peptic ulcer: amoxicillin, clarithromycin, tetracycline, metronidazole. Consensus principles "Maastricht-4" in the treatment of H. pylori infection: indications for eradication, basic therapy regimens, methods of monitoring the effectiveness of treatment.
		Theme 3	**3. Hormones of the pituitary gland, hypothalamus, pineal gland, thyroid and pancreas, hypoglycemic drugs.**

			Antidiabetic drugs: insulins (ultrashort, short, medium duration, long-acting), sulfonylurea derivatives (glibenclamide, glyvidone), glinides (repaglinide), biguanides (metformin), α-glycosidase inhibitors (acarbose), thiazolidiindiones, dipeptidyl-peptidase-4 inhibitors (DPP-4) (vildagliptin), GLP-1 analogs and agonists (liraglutide), amylin analogs (pramlintide acetate), gliflozins (SGLT2 inhibitors). Thyroid hormone preparations and antithyroid drugs (L-thyroxine, mercazolil, thiamazole, potassium iodide). Preparations of hormones of the pituitary gland and hypothalamus. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients. Principles of substitution therapy.
		Theme 4	4. **Hormonal preparations of steroid structure Sex steroids. Contraceptives. Anabolic drugs. Glucocorticosteroids.** Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients. Principles of substitution therapy.
		Theme 5	**5. Drugs affecting immune processes**. I. Cytostatics: a) alkylating agents: cyclophosphamide b) antimetabolites: azathioprine methotrexate Glucocorticoids: prednisone, etc. Drugs that inhibit the formation or action of IL-2: a) antibiotics: cyclosporine tacrolimus, rapamycin b) MAT preparations for IL-2 receptors: basiliximab, daclizumab. Antibody preparations: a) Polyclonal antibodies - anti-thymocyte immunoglobulin b) MAT to TNF-alpha - infliximabi etc.

		Theme 6	4-aminoquinoline derivatives (chloroquine, hydroxychloroquine), D-penicillamine, Gold preparations (sodium aurothiomalate, auranofin, etc.). Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients. II. Immunostimulants. Preparations of bacterial and fungal origin, their synthetic and semi-synthetic analogs. Preparations of animal origin. Cytokines (interferons, interleukins) and stimulators of their formation in the body. Herbal preparations. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients. **6. Antiallergic drugs** Types of allergic reactions. Pathogenesis of allergic and pseudo-allergic reactions. Points of application of drugs. Drugs for the treatment of immediate-type hypersensitivity reactions (HNT): 1) agents that prevent the release of histamine and other mediators of allergy - glucocorticoids, cromoglycic acid (cromolyn sodium, intal); 2) antihistamines - H1-histamine blockers; 3) symptomatic agents - adrenergic agonists (adrenaline, ephedrine), myotropic bronchodilators (aminophylline). Drugs for the treatment of delayed-type hypersensitivity reactions (HRT): GCS, cytostatics, NSAIDs. Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Use in special categories of patients.

6.	**Medicines affecting the central nervous system. Medicines affecting the nociceptive system and the synthesis of pain and inflammation mediators**	**Theme 1** **Theme 2** **Theme 3** **Theme 4**	1. Preparations for inhalation and intravenous anesthesia. Opioid analgesics. Non-steroidal anti-inflammatory drugs (NSAIDs). 2. Sedative drugs, hypnotic drugs. Antiepileptic drugs. 3. Antipsychotics. Antidepressants. Drugs for the treatment of manias. 4. Psychostimulants. Nootropics (piracetam). Drugs for neurodegenerative diseases.
7.	**Antibacterial, antiviral and antifungal medicines**	**Theme1** **Theme 2**	**1. Antibiotics** The main clinically significant pathogens and infectious diseases caused by them. Mechanisms of resistance. General features of antimicrobial drugs. Types of antimicrobial pharmacotherapy. Principles of antimicrobial therapy. Classification of antibiotics and their mechanisms of action. Beta-lactam antibiotics. Pharmacology of penicillins (benzylpenicillin, amoxicillin, ampicillin, oxacillin, piperacillin). Pharmacology of cephalosporins (1st generation: cefazolin, cephalexin, cefaclor; 2nd generation: cefamandol, cefuroxime; 3rd generation: cefoperazone, cefotaxime, ceftriaxone; 4th generation: ce-fepime, 5th generation: ceftobiprol). Pharmacology of carbapenems (imipenem, meropenem) and monobactams (aztreonam). Non-beta-lactam antibiotics. Pharmacology of aminoglycosides (gentamicin, amikacin, tobramycin, netilmicin). Pharmacology of macrolides (erythromycin, roxithromycin, azithromycin, clarithromycin). Pharmacology of tetracyclines (tetracycline, doxycycline) and glycopeptides (vancomycin, teicoplanin). New groups of antibiotics: oxazolidinediones (linezolid), lipopeptides (daptomycin), glycillcyclins (tigecycline), pleuromutilins (retapamulin). **2. Synthetic antimicrobial agents:**

		Theme 3 **Theme 4** **Theme 5**	Sulfonamides, derivatives of quinolone and fluoroquinolone, derivatives of 5-nitrofuran, imidazole. **3.Antiviral, antifungal agents.** Antifungal: amphotericin B, itraconazole, ketoconazole, clotrimazole, nystatin, polygynax, sertaconazole, fluconazole. Antiviral: anti-herpetic, anti-cytomegalovirus, anti-influenza (M2 channel blockers, neuroaminidase inhibitors), antiretroviral drugs. **4. Anti-tuberculosis drugs.** 1st line drugs, 2nd line drugs. Anti-tuberculosis chemotherapy regimens. **5. Antiprotozoal, anti-syphilitic, antihelminthic agents** Antiprotozoal: quinine, chloroquine, primaquine Antiparasitic: levamisole, mebendazole, albendazole, pyrantel, diethylcarbazine, praziquantel Classification. Pharmacodynamics of the drug group, mechanism of action. Pharmacokinetic parameters of the drug group. Indications. Contraindications Adverse reactions. Drug interaction. Application in special categories of patients.

5.2. Sections of disciplines and types of classes

№	The name of discipline section	Lectures	Practical lessons (PL)	Laboratory works (LW)	Independent work	Total, h
1.	General Pharmacology. Introduction into discipline	2		16	12	30
2.	Agents affecting afferent and efferent innervation	5		20	14	39
3.	Drugs affecting the cardiovascular system	8		24	15	47

4.	Drugs affecting hemostasis and hematopoiesis	2		8	12	22
5.	Drugs affecting the functions of the respiratory system, digestion and metabolic processes	4		18	14	36
6.	Agents affecting the central nervous system. Drugs affecting the nociceptive system and the synthesis of pain and inflammation mediators	8		21	12	41
7.	Antibacterial, antiviral, antifungal and antiprotozoal agents	6		18	13	37
	Total	**35**		**125**	**92**	**252**

6. Laboratory workshop (depends on availability)

The curriculum for the specialty "General Medicine" provides for the discipline "Pharmacology" 4 hours of laboratory lessons per week (68 hours in total) in the 5th semester and 3 hours per week for the 6th semester (54 in total), the total amount of hours for laboratory lesson for the discipline is 122 hours.

Table 4.

Laboratory workshop

№ of theme	№ discipline section	The name of theme	Total labor content (hours)
5th semester			
1	1	General Pharmacology. Introduction into discipline	4
2	1	Pharmacodynamics of drugs	4
3	1	Pharmacokinetics of drugs	4
4	1	1st Colloquium	4

5	2	Drugs, affecting afferent innervation. Local anesthetics.	4
6	2	Cholinergic agents	4
7	2	Adrenomimetic and sympathomimetic agents	4
8	2	Adrenolytic and sympatholytic agents.	4
9	2	2nd Colloquium	4
10	3	Diuretics	4
11	3	Hypolipidemic agents	4
12	3	Antihypertensives	4
13	3	Antianginal agents	4
14	3	Antiarrhythmics	4
15	3	Drugs to manage heart failure	4
16	3	3rd Colloquium	4
17	4	Drugs that affect the blood coagulation system Drugs that affect the hematopoiesis system	4
6th semester			
1.	5	Drugs that affect the function of the respiratory system	3
2.	5	Drugs affecting GIT functions	3
3.	5	Hormones of the pituitary gland, hypothalamus, epiphysis, thyroid and pancreas, hypoglycemic agents	3
4.	5	Steroid hormones	3
5.	5	Drugs affecting immune system	3
6.	5	Antiallergic agents	3
7.	6	4th Colloquium	3
8.	6	Drugs for general anesthesia. Sedatives. Hypnotics.	3
9.	6	Anxiolytics. Psychostimulants. Nootropic agents. Drugs for neurodegenerative diseases	3
10.	6	Neuroleptics. Antidepressants. Antiepileptics.	3
11.	6	NSAIDs Analgetics.	3
12.	6	5th Colloquium	3
13.	6	Antiinfectious therapy. Antibiotics.	3
14.	7	Synthetic antibacterials.	3
15.	7	Antiviral agents. Antimycotics.	3
16.	7	Drugs for treatment of tuberculosis	3
17.	7	Antiprotozoal agents. Agents to treat syphilis. Antihelmints.	3
18.	7	6th Colloquium	
Total			**122**

7. Practical lessons (seminars) - not included in the program.

8. Material supply of the Discipline:

The number of rooms assigned to the Department - 10

The number of laboratories and offices of the Department - 13

Table 5.

Availability of educational and scientific equipment in the premises of the Department (the main equipment, the year of purchase)

№	Position	Quantity
1	Tablet PTZ-930G-EN	1
2	System unit Ergo Corp1294W	1
3	Multifunction device HP OfficeJet J6413	1
4	System unit Ergo Corp 1294W	1
5	Printer HP LJ 1320	1
6	Copy machine Canon 128/228	1
7	Multifunction device HP OfficeJet J6413	1
8	Monitor Acer TFT 17" V173Ab	1
9	Printer HP LJ P2015N	1
10	Monitor 17" LG F700P сч.104	1
11	Copy machine Canon Personal Copier FC128	1
12	Monitor Acer TFT 17" V173Ab сч.09/101 от 01.09.09	1
13	System unit Ergo Corp 1294W сч.09/101 от 01.09.09	1
14	Stand 1,2 x 1,1 м	1
15	System unit + monitor	1
16	Monoblock MSI Wind Top AE2282G-013RU White	1
17	Monoblock LENOVO S500zA	1
18	Tripod screen PnoScreen(153*2030)	3
	Total	20

9. Information Support of discipline

The list of information technologies used in the implementation of the educational process in the discipline (module), including a list of software and information systems of reference (if necessary) is specified:

9.1. Software.

- Adobe Reader
- HP Document Manager
- HP Photosmart Essential 2.5
- Internet Explorer
- Microsoft Office
- OpenOffice.org 3.1

- PuntoSwitcher
- KMPlayer
- 7-zip

9.2. Database, information and referral and search engines:

- Britannica Online: The online encyclopedia and dictionary
- elibrary.ru
- www.AMEDEO.com
- www.MedicineonEarth.com
- www.FreeBooks4Doctors.com
- www.FreeMedicalJournals.com/htm/phil.htm
- http://health.elsevier.ru/electronic/product_scopus/ Реферативная база данных Scopus http://www.embase.com/home
- http://www.medscape.com/
- http://www.ncbi.nlm.nih.gov/pubmed/
- http://www.nlm.nih.gov/
- http://www.nlm.nih.gov/databases/ http://www.regmed.ru/

9.3. Courses of video lectures and presentations on the discipline Pharmacology

Video lectures are located on TUIS (https://esystem.rudn.ru/course/view.php?id=5729)

10. The educational-methodical support of discipline:

(the presence of print and electronic educational and information resources is indicated)

A. Basic literature

1. Illustrated textbook / editor R.N. Alyautdin. - Электронные текстовые данные. - Moscow : GEOTAR-Media, 2020. - 312 p. - Книга на английском языке. - ISBN 978-5-9704-5665-1.

2. Pharmacology : textbook / D.A. Kharkevitch; Translation of Russian textbook, 12th edition, revised and improved. - 2nd edition. - M. : ГЭОТАР-Медиа, 2017. - 680 pages with illustrations. - Книга на английском языке. - ISBN 978-5-9704-3883-1.

B. Additional literature

1. Basic and Clinical Pharmacology / B. Katzung, S. Masters. - 11th ed. ; Книга на английском языке. - New York : McGraw-Hill, 2009. - 1218 p. : il. - (LANGE Basic Science). - ISBN 978-007-127118-9 : 4318.03.

2. Essentials of Medical Pharmacology / K.D. Tripathi. - 6th ed. ; Книга на английском языке. - New Delhi : Jaypee Brothers Medical Publishers, 2008. - 940 p. : il. - ISBN 978-81-8448-085-7 : 2463.44.

3. Clinical Pharmacology / P.N. Bennett, M.J. Brown. - 10th ed. ; Книга на английском языке. - Edinburgh : Churchill Livingstone, 2008. - 694 p. : il. - ISBN 978-0-443-10245-5 : 2048.65.

4. Introduction to Clinical Pharmacology [Текст] / M.W. Edmunds. - Third edition. - Boston : Mosby, 2000. - 487 p. : il. - (Edmunds). - ISBN 0-323-00845-3 :

50.00.

5. Tutorial Guide to Pharmacodynamics [Текст] = Пособие по фармакологии : Учебное пособие / S.K. Zyryanov, O.I. Butranova. - Книга на английском языке. - M. : PFUR, 2019. - 56 с. : ил. - 350.00.

C. List of electronic library systems

1. Электронно-библиотечная система РУДН – ЭБС РУДН: http://lib.rudn.ru:8080/MegaPro/Web
2. Университетская библиотека онлайн: http://www.biblioclub.ru
3. IQlib: http://www.iqlib.ru
4. НЭБ Elibrary: http://elibrary.ru
5. Science Direct: http://www.sciencedirect.com
6. EBSCO: http://search.ebscohost.com
7. Oxford University Press: http://www3.oup.co.uk/jnls
8. Sage Publications: http://online.sagepub.com
9. Springer/Kluwer: http://www.springerlink.com
10. Tailor & Francis: http://www.informaworld.com
11. Web of Science: http://www.isiknowledge.com
12. Университетская информационная система РОССИЯ: http://www.cir.ru/index.jsp
13. Учебный портал РУДН: http://web-local.rudn.ru/
14. U.S. National Library of Medicine National Institutes of Health: http://www.ncbi.nlm.nih.gov/pubmed/
15. Консультант студента http://www.studmedlib.ru
16. ACS Publications: База данных / American Chemical Society. - База данных на английском языке. - Washington : ACS Publications, 2013. - Режим доступа: http://pubs.acs.org/
17. RSC Journals : База данных / Royal Society of Chemistry. - База данных на английском языке. - London : RSC Publishing, 2013. - Режим доступа: http://pubs.rsc.org/
18. Springer Link: База данных / Springer Science+Business Media. - База данных на английском языке. - Berlin : Springer Science+Business Media, 2013. - Режим доступа: http://link.springer.com/.

11. Guidelines for students to study the discipline (module)

The study of the discipline is organized according to a credit-modular system with the use of appropriate laboratory equipment, computers, multimedia installations.

Independent work of students implies preparation for practical exercises, lectures and final written tests and includes the work of a student with basic and additional literature on the topics of classes and lectures.

Work with educational literature is considered as a type of educational work in the discipline of pharmacology and is performed within the hours allotted for its study (in the IWS section).

Each student is provided with access to the library funds of the University and the department.

For each section of the discipline, guidelines for students and guidelines for

teachers have been developed, available in TUIS in sections of curricula corresponding to specialties

12. Fund of assessment tools for intermediate certification of students in the discipline "Pharmacology"

Materials for assessing the level of mastering the educational material of the discipline "Pharmacology" "(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, typical control tasks or other materials , necessary for the assessment of knowledge, abilities, skills and (or) experience of activities that characterize the stages of the formation of competencies in the process of mastering the educational program, methodological materials defining the procedures for assessing knowledge, skills, skills and (or) experience of activities, characterizing the stages of formation of competencies, have been developed in full and are available for students on the discipline page at TUIS RUDN.

The program was drawn up in accordance with the requirements of the Federal State Educational Standard of Higher Education.

Developers:

Assoc. prof. of Department of
General and Clinical Pharmacology — Butranova O.I.

Head of Department of
General and Clinical Pharmacology — Zyryanov S K.

Head of the program — **Radysh I.V.**