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

Medical Institute

Recommended MCSD

SYLLABUS

(STUDY GUIDE)

Subject

Clinical Pharmacology

Recommended for the direction of training (specialty)

31.05.01 General Medicine

Program (profile, specialization)

General Medicine

1. **Aims and objectives of the discipline:** To master theoretical knowledge and practical skills of choosing and prescribing effective, safe and economically reasonable drugs in order to be able to use rational and personalized pharmacotherapy based on the authentic data on pharmacokinetics, pharmacodynamics, drug interactions, adverse drug reactions, pharmacogenetics, pharmacoeconomics, pharmacoepidemiology and principles of evidence-based medicine.

   Objectives:

   - gain knowledge of general and specific issues of clinical pharmacology;
   - gain knowledge of basic methods of rational drug prescribing (recommended by WHO Groningen model that includes two basic algorithms – making P-list (personal) of drugs and choosing P-treatment using four criteria – Efficacy, Safety, Suitability, Cost);
   - gain skills necessary in physician's work to prescribe personalized pharmacotherapy to patients through choosing effective and safe drugs and to use adequate methods of monitoring safety and efficacy of prescribed medical treatment;
   - gain skills of prescribing drugs to patients from risk groups;
   - gain skills of prescribing drugs taking into account possible drug interactions;
   - gain skills of presenting reliable independent evidence about benefit and risk of using drugs;
   - gain skills of working with scientific literature (articles, systematic reviews, clinical guidelines).

2. **Place of the discipline in the structure of OP HE:**

Discipline ***«Clinical Pharmacology»*** refers to the basic part of Block 2 of the curriculum.

Table 1 contains preceding and following disciplines aimed at forming competences of the given discipline in accordance with the matrix competences OP HE.

Table 1. Preceding and following disciplines aimed at formation of competencies.

№	Code and title of competence	Preceding disciplines	Following disciplines (groups of disciplines)
General Professional Competencies			
1.	GPC-7	Pharmacology; Biotechnology; Medical recovery; Dermatovenerology; Neurology, medical genetics, neurosurgery; Professional diseases; Faculty surgery; Endocrinology; Polyclinical therapy; Urology; Obstetrics and gynecology; General surgery; Traumatology, orthopedy; Pediatrics; Evidence-based medicine; Tracheotomy in modern otolaryngology; Out-patient cardiology; Assistant of ward nurse; Assistant of physician; Assistant of physician in out-patient primary care	Anesthesiology, resuscitation, intensive care; Maxillofacial surgery; Endoscopic urology; Reproductive health; Oncology, x-ray therapy; Hospital therapy
Professional Competencies (medical activity)			
2.	PC-3	Medical recovery; Dermatovenerology; Neurology, medical genetics, neurosurgery; Propedeutics of internal diseases; Imaging diagnostics; Professional diseases; Faculty surgery; General surgery; Faculty surgery; Urology; Ophthalmology; Life safety; Dentistry; Obstetrics and gynecology; Pediatrics; Evidence-based medicine; Actual issues of neonatology; Fundamentals of child threpsology; Out-patient cardiology; Assistant of physician; Assistant of physician in out-patient primary care	Anesthesiology, resuscitation, intensive care; Disaster medicine; Oncology, radiation therapy; Hospital therapy; Hospital surgery; Pediatric surgery

3. **Requirements to results of mastering the discipline:** The process of studying the discipline is aimed at the formation of the following competences: **GPC-7, PC-3.**

As a result of study of the discipline a student must:

Know:

1. Group affiliation and PD of main drugs.
2. Main PK parameters of drugs, their change at various diseases of internal organs, various physiological conditions, presence of bad habits (alcoholism, drug addiction, smoking, etc.), phenotypic and genotypic peculiarities of an organism.
3. Basic principles of carrying out of PK researches and monitor observation over a concentration of drugs (especially drugs with a narrow therapeutic index).
4. Basic principles of determination dosage regimen of drugs, proceeding from peculiarities of absorption, distribution, metabolism and excretion of drugs, chronopharmacology data.
5. Interconnection of pharmacokinetic parameters and pharmacodynamic effects of drugs.
6. Types of drugs interaction (pharmacokinetic, pharmacodynamic, pharmaceutical), polypharmacy problems (frequency, danger, economic aspects).
7. Main ADRs of the most common drugs, their detection, classification and registration. methods of prevention and correction of ADRs.
8. Principals of clinical trials conduct and registration of new drugs, phases and types of clinical studies of new drugs.
9. Fundamentals of evidence-based medicine.
10. Fundamentals of pharmacoepidemiology, pharmacoeconomics and pharmacogenetics.
11. Methods of evaluation of clinical efficacy and safety of conducted drug therapy.

Be able to:

1. Analyzing the drug effect on the totality of their pharmacological properties and the possibility of their use for therapeutic treatment.
2. Writing prescription, to use various dosage forms at treatment of certain pathological conditions, proceeding from peculiarities of their pharmacodynamics and pharmacokinetics.
3. Assessing the causality between adverse reaction and drug intake.
4. Reporting revealed adverse drug reactions to pharmacovigilance department using standard procedure and specific form.
5. Choosing adequate dosing regimen and adjusting doses in patients with liver and/or kidney disorders.
6. Assessing possible manifestations of drug overdose and ways to eliminate them.

Manage:

1. Skills to rationally use drugs for treatment and prevention of different diseases and pathological conditions.

4. Volume of the discipline and types of study:

General credit value of the discipline is **3 credit units**.

Type of study	**Total hours**	**Semesters**
		11
Class hours (total)	**66**	
Including:	-	
Practical training (PT)	66	
Self-work (total)	**42**	
Total labor input hours	**108**	
Credit Unit	**3**	

5. Contents of the discipline.

5.1. The contents of the discipline sections:

№	Name of the section of discipline	Contents of the section
1.	**General issues of clinical pharmacology.**	
	1.1. Subject and tasks of clinical pharmacology (CP). Clinical research. Principles of evidence-based medicine.	Subject and tasks of the CP. Pharmacoepidemiology, pharmacoeconomics, their content and significance. Federal Law on Medicines. Formula system (formula list, formula article). Stages of clinical trials of new drugs, modern methods of clinical trials. Concepts about controlled clinical trials, principles of evidence-based medicine, its main provisions.
	1.2. Fundamentals of clinical pharmacodynamics	Clinical pharmacodynamics. Definition. Basic concepts. The difference between drugs in pharmacological action. Pharmacological and pharmacodynamic "targets". The main approaches to achieving the "target" – selective action of drugs. Drug effects. Pharmacodynamic and clinical efficacy of drugs. Criteria for assessing pharmacodynamic and clinical efficacy of drugs.
	1.3. Fundamentals of clinical pharmacokinetics.	Subject and tasks of clinical pharmacokinetics. Pharmacokinetic studies in clinical pharmacology. Bioequivalence studies. Pharmacokinetic curve. Types of pharmacokinetic curve. Control over the concentration of drugs in clinical practice (Therapeutic Drug Monitoring), its purpose. The main pharmacokinetic parameters, their role in rational pharmacotherapy (equilibrium concentration, time required to achieve it; minimum equilibrium concentration; maximum equilibrium concentration concentration; maximum concentration (Cmax); time to reach maximum concentration (Tmax); half-life period (T ½); average retention time of the drug in the body (MRT); area under the pharmacokinetic curve (AUC) Patient factors influencing bioavailability, distribution, metabolism and excretion of drugs. Principles of dosing drugs. Dosing as a way to influence the concentration-time curve. Types of doses. Correction of the dose in case of violations of the function of organs of removal of drugs.
	1.4. Interaction of Medicines	The concept of interaction of drugs, types of interaction (pharmacokinetic, pharmacodynamic). Results of drug interaction. Principles of rational combination of drugs.
	1.5. Drug safety. Adverse drug reactions	Modern concepts and terms in the field of drug safety (adverse effect (AE), adverse drug reactions (ADR), classification of risk levels and types of ADR (WHO). Evaluation of the probability of the relationship of an undesirable event with the action of the drug. Methods of detection, forecasting, prevention and correction of ADR. Features of drug use by pregnant women, classification of risk levels. The use of drugs during lactation. General principles of increasing the safety of pharmacotherapy in elderly patients. Organization of drug safety control systems in different countries. Pharmacovigilance.
	1.6. Principles of assessing the effectiveness and safety of drug use.	Concepts about the general principles of evaluating the effectiveness and safety of the use of drugs in patients, including the assessment of the quality of life. The importance of clinical and laboratory-instrumental methods for assessing the effectiveness and safety of drug use.

	Fundamentals of rational pharmacotherapy (P-drug and P-treatment).	Methodological bases of rational choice of medicines. The main criteria are: efficiency, safety, acceptability, cost. Selection of medicines for compiling an individual list of P(personal)-drugs. The process of rational individualized treatment (P-treatment).
2.	**Specific issues of clinical pharmacology.**	
	2.1. Clinical pharmacology of drugs affecting the main functions of the myocardium.	• Clinical Pharmacology of medications for treatment of stable ischemic heart disease. • Clinical pharmacology of drugs used for the treatment of CHF. • Clinical pharmacology of antiarrhythmic drugs**.** Principles of clinical and pharmacological approach to the choice of medicines for the treatment of these diseases and relief of emergency conditions in the pathology of the cardiovascular system.
	2.2. Clinical pharmacology of drugs affecting vascular tone.	• Clinical pharmacology of vasodilators, vasoconstrictors. • Clinical pharmacology of drugs for treatment arterial hypertension. Principles of clinical and pharmacological approach to the choice of drugs for the treatment and relief of emergency conditions in different groups of patients with arterial hypertension.
	2.3. Clinical pharmacology of hypolypidemics and metabolic correctors.	Methods of diagnostics of hyperlipidemic states. Types of hyperlipidemia. Selection of optimal drugs depending on the type of hyperlipidemia. Methods for evaluating efficiency and safety. Diagnosis, correction and prevention of unwanted reactions. Possible interactions in combination with drugs of other groups.
	2.4. Clinical pharmacology of drugs affecting hemostasis and hemopoesis.	• Clinical pharmacology of drugs for the treatment and prevention of arterial and venous thrombosis. • Clinical Pharmacology of Medicines for Stopping and Preventing Bleeding • Clinical pharmacology of medicines for the treatment of anemia. Principles of choice and determination of dosing mode depending on the state of coagulation, anticlotting, fibrinolytic systems of the patient, data of PC and PD drugs and their features in the disease liver, kidneys, gastrointestinal tract, hematopoiesis, cardiovascular system; use in different periods of pregnancy, in nursing women and elderly persons. Methods for evaluating the effectiveness and safety of the treatment.
	2.5. Clinical pharmacology of medicines affecting the respiratory system.	• Clinical pharmacology of anti-asthmatic drugs (remedies for arrest of attacks and prolonged control of bronchial asthma). • Clinical pharmacology of drugs for the treatment of COPD. • Clinical pharmacology of drugs for the treatment of pulmonary hypertension. Principles of clinical and pharmacological approach to the choice of medicines for the treatment of these diseases. Control over the effectiveness and safety of the treatment. Rational drug combinations.
	2.6. Clinical pharmacology of medicines affecting the organs of the digestive system.	• Clinical pharmacology of medicines for the treatment of gastric ulcer and duodenal ulcer, gastroesophageal reflux disease (GERD). • Clinical pharmacology of drugs for the treatment of acute and chronic hepatitis. • Clinical pharmacology of medicines for the treatment of diseases of the biliary tract.

		• Clinical pharmacology of drugs for the treatment of pancreatic diseases. • Clinical pharmacology of medicines for the treatment of bowel diseases. Principles of clinical and pharmacological approach to the choice of medicines for the treatment of these diseases. Control over the effectiveness and safety of the treatment. Rational drug combinations.
	2.7. Clinical pharmacology of medicines used in diseases of the kidneys and urinary tract.	• Clinical pharmacology of medicines used for the treatment of glomerulonephritis, pyelonephritis, renal failure, urinary tract diseases and bladder.
	2.8. Clinical pharmacology of medicines used in endocrinology.	• Clinical pharmacology of hypothalamus hormones and their synthetic analogues. • Clinical pharmacology of pituitary hormones and their synthetic analogues. • Clinical pharmacology of adrenal cortex hormones and their synthetic analogues. • Clinical pharmacology of sex hormones and their synthetic analogues. Contraceptive and anti-menopausal agents. • Clinical pharmacology of medicines affecting thyroid function. • Clinical pharmacology of hypoglycemic medicines.
	2.9. Clinical pharmacology of drugs for the treatment of inflammatory diseases of connective tissue.	• Clinical pharmacology of non-steroidal anti-inflammatory drugs. • Clinical pharmacology of steroidal anti-inflammatory drugs. • Clinical pharmacology of monoclonal antibodies.
	2.10. Clinical pharmacology of medicines used for violations of immunity and allergic conditions.	• Clinical pharmacology of cytostatics • Clinical pharmacology of immunomodulators • Clinical pharmacology of anti-allergic drugs
	2.11. Clinical pharmacology of anti-infectious drugs.	• Clinical pharmacology of immunobiological drugs • Clinical pharmacology of antibacterial drugs • Clinical pharmacology of drugs for the treatment of antibiotic-associated diarrhea • Clinical pharmacology of antiviral drugs • Clinical pharmacology of anti-mycotic drugs • Clinical pharmacology of anti-prototic drugs
	2.12. Clinical pharmacology of psychotics.	• Neuroleptics; Tranquilizers; Antidepressants; Sleeping pills; Nootropic drugs. Clinical and pharmacological approaches to the selection of groups and specific drugs for pharmacotherapy of basic psychopathological syndromes. • Drug analgesics. Clinical and pharmacological approaches to the treatment of acute and chronic pain syndrome.

5.2. Sections of the discipline and types of classes:

№	Name of the section of discipline	PT	SW	Total hours
1.	Subject and objectives of clinical pharmacology. Clinical trials. Principles of evidence-based medicine.	6	4	10
2.	Fundamentals of clinical pharmacodynamics.	2	-	2
3.	Fundamentals of clinical pharmacokinetics.	6	3	9
4.	Drug interactions.	2	1	3
5.	Drug safety. Adverse drug reactions.	2	-	2
6.	Principles of efficacy and safety assessment of drugs use. Fundamentals of rational pharmacotherapy (P-drug and P-treatment).	6	2	8
7.	Clinical pharmacology of drugs affecting the main functions of the myocardium.	3	1	4
8.	Clinical pharmacology of drugs affecting vascular tone.	3	1	4
9.	Clinical pharmacology of hypolipidemics and metabolic correctors.	3	1	4
10.	Clinical pharmacology of drugs affecting hemostasis and hemopoesis.	3	1	4
11.	Clinical pharmacology of drugs affecting respiratory system.	6	2	8
12.	Clinical pharmacology of medicines affecting the organs of the digestive system.	6	2	8
13.	Clinical pharmacology of medicines used in diseases of the kidneys and urinary tract.	1	-	1
14.	Clinical pharmacology of medicines used in endocrinology.	6	2	8
15.	Clinical pharmacology of drugs for the treatment of inflammatory diseases of connective tissue.	3	1	4
16.	Clinical pharmacology of medicines used for violations of immunity and allergic conditions.	2	1	3
17.	Clinical pharmacology of anti-infectious drugs.	5	2	7
18.	Clinical pharmacology of psychotics.	1	-	1
19.	Coursework (term paper)	-	18	18

6. Laboratory training: not applicable

7. Practical training:

№	№ of discipline section	Topics of laboratory training	Workload (hours)
1.	1.1.	Introduction to clinical pharmacology. Subject and problems of clinical pharmacology. Fundamentals of pharmacoepidemiology and pharmacoeconomics. Clinical trials. Principles of evidence-based medicine.	10
2.	1.2., 1.3., 1.4.	Fundamentals of clinical pharmacodynamics and pharmacokinetics. Drug interactions. Fundamentals of clinical pharmacogenetics.	8
3.	1.3., 1.5.	Drug safety. Adverse drug reactions. Drug dosing.	8
4.	1.6.	Fundamentals of rational pharmacotherapy, algorithm of P-drug selection. Algorithm of P-treatment selection.	8
5.	2.1., 2.2., 2.7.	Clinical pharmacology of drugs for treatment of CVD. Guidelines of treatment of ischemic heart disease, arterial hypertension and heart failure.	8
6.	2.3., 2.4.	Clinical pharmacology lipid-lowering drugs. Clinical pharmacology of drugs influencing the system of a hemostasis.	8
7.	2.5.	Clinical pharmacology of drugs influencing respiratory organs. Guidelines of treatment of patients with asthma, COPD, pulmonary hypertension.	8
8.	2.6.	Clinical pharmacology of drugs influencing GIT.	8
9.	2.8.	Clinical pharmacology of the drugs used in endocrine system disorders.	8
10.	2.9., 2.10., 2.12.	Clinical pharmacology of anti-inflammatory drugs, anti-allergic and immune-modifying drugs. Guidelines of treatment of acute and chronic pain.	8
11.	2.7., 2.11.	Principles of rational anti-infectious therapy. Algorithms of treatment of infections of various localizations. Complications of antimicrobial therapy. Guidelines of treatment of antibiotic-associated diarrhea.	8
	1-2	Coursework (term paper).	18
		TOTAL:	**108**

8. Material and technical support of the discipline:

Number of clinical bases – 2
Number of premises given to the department – 4
Number of units of educational and scientific equipment – 6

Room	Room name	Equipment
121 (133)	**Conference hall (ГБУЗ ГП № 2 ДЗМ) –** classroom for lectures.	Multimedia device.
400	**Training class (ГБУЗ ГП № 2 ДЗМ**) – classroom for seminars, group and individual consultations, ongoing control and interim attestation, as well as for independent work.	Multimedia device, interactive board SMART. Internet access.
301	**ГБУЗ ГКБ № 24 ДЗМ** *3rd floor* – classroom for seminars, group and individual consultations, ongoing control and interim attestation, as well as for independent work. *2nd floor* – classroom for lectures.	Multimedia device, board. Internet access.

9. Information support of the discipline:

а) *Software:*
- MS Office;
- Internet Explorer;
- SMART NoteBook.

б) *Databases, reference and search systems:*

1. Electronic Library System (ELS) of the RUDN University and third-party ELS, to which university students have access on the basis of concluded contracts:
- Electronic Library System (ELS) of the RUDN **http://lib.rudn.ru/MegaPro/Web**
- ELS «Университетская библиотека онлайн» **http://www.biblioclub.ru**
- ELS Юрайт **http://www.biblio-online.ru**
- ELS «Консультант студента» **www.studentlibrary.ru**
- ScienceDirect **https://www.sciencedirect.com/**
- Springer **https://www.springer.com/gp**
- Oxford University Press **http://global.oup.com/?cc=ru**

2. Databases and search engines:
- State register of drugs **http://www.drugreg.ru/Bases/WebReestrQuery.asp**
- European society of clinical pharmacologists and general practitioners **http://www.eacpt.org**
- American society of clinical pharmacologists and general practitioners **http://www.ascpt.org/**
- Source on pharmacogenetics **http://www.pharmgkb.org/**
- Source of drug interactions **http://medicine.iupui.edu/flockhart/**

10. Educational and methodical support of the discipline.

a) Main literature:

1. 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

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. S.B. Fitilev, I.I. Shkrebneva, A.V. Vozzhaev. The Fundamentals of Rational Pharmacotherapy (Problem-Based Method of Teaching Clinical Pharmacology or How to Create Your Own Guideline) (учебное пособие на английском языке). Москва: РУДН, 2017. – 85 с.

11. Guidelines for students on the development of the discipline (module).

The course consists of two modules: 1. General issues of clinical pharmacology. and 2. Specific issues of clinical pharmacology.

Mastering of discipline is carried out through laboratory training with the use of various forms of independent work of students, which concludes with writing of coursework on the subject: "Analysis of patient medical record (history) and expert review of the prescribed pharmacotherapy" (modules 1 and 2) and final test (module 1).

As a teaching and methodical approach on the course of clinical pharmacology, the recommended World Health Organization Groningen model (the so-called P-method) is used, implying the existence of two major successive Treatment algorithms – Compiling the P-list (personal) of medicinal products and the choice of P-treatment (for a particular patient) on the basis of four criteria – efficiency, safety, acceptability and cost (using the system of rating coefficients). This method focuses on the process of prescribing medications and enables students to think for themselves rather than to follow blindly the recommendations of others. It allows to understand why national and specialized recommendations on treatment of certain nosologies were chosen. This method reliably increases the effect of memorization and the ability to use information to solve problems of other patients (transmission effect). Also, a lot of attention in the work with students is devoted to communication with patients and implementation of monitoring of treatment. The method is motivated to work with the latest information and allows to understand the positive and negative sides of its sources.

To provide thorough mastering of the specific topic main issues of the topic, presentation, short content of the topic, national and international guidelines are uploaded to the TUIS RUDN system. Homework is developed for every topic.

To control students' knowledge different tests are applied: initial tests, tests for self-control and topic control tests. Clinical cases are also used.

Various forms of discussions are actively used in the classes, medicinal forms are prepared on the basis of evidence-based medicine (literary and electronic sources of information), analysis of pharmacotherapy with study of PK, PD, drug interactions, ADR included in the therapy of a particular patient.

Students' skills of working with specific literature are trained. One of the methods of training is preparation of scientific reports in the form of presentations, the subjects of which are defined at the beginning of the cycle according to students' choice from the list of topics presented by the teacher.

Example:

Methodical recommendations for task on the topic "Evidence-based medicine. Clinical trials". ***General Medicine.***

Task for self-work "Clinical trial presentation"

Please find clinical trial of the drug that was assigned to you by the teacher and give brief description of the study in the from of Power Point presentation according to the following plan:

1. Describe the burden caused by the disease which is the primary indication for the given drug:
- morbidity, mortality caused by the disease including recent trends;
- economic burden of the disease for healthcare;
- standard pharmacotherapy used to treat the disease;

2. Describe briefly the given drug:
- place of the drug in pharmacotherapy algorithms of the disease;
- mechanism of action of the drug;
- advantages of the drug in comparison with some other drugs used to treat the disease;

3. Identify the stage of development of given drug:
- is it a first-in-human trial;
- what is already known about the safety profile;
- what phase the chosen clinical trial refers to (justify);

4. Describe objectives of chosen clinical trial:
- identify primary and secondary objectives;

5. Describe the study population:
- specify key inclusion criteria;
- indicate only the most important exclusion criteria;

6. Specify efficacy and safety criteria:
- list efficacy parameters (variables of interest);
- list safety parameters;

7. Describe briefly clinical study design:
- way of administration and dosing regimen(s) of the study drug;
- blinding (if applicable);
- control group (if applicable);
- randomization (if applicable);
- what countries take part in the trial;

8. Describe shortly the main results of the study:
- indicate primary results data on efficacy assessment (tables, graphs, diagrams, etc)
- describe safety data obtained from the trial;

9. Give your opinion about medical importance (significance) of the results of the study in terms of the pharmacotherapy of the target disease.

Possible sources: **https://www.ncbi.nlm.nih.gov/pubmed/** / **https://clinicaltrials.gov**/ / **https://www.cochrane.org/**

Please upload your presentation on TUIS.

12. Fund of estimated means for the interim assessment of students in the discipline (module).

Materials to assess the level of mastering of the educational material of the discipline «Clinical pharmacology» developed in full volume and available to students at the discipline course page on TUIS RUDN platform.
These materials (estimated means) include: list of competences with stages of their formation; description of assessment parameters and criteria of competences at different stages; description of assessment scales; sample control tasks or other materials necessary to estimate knowledge, skills and experience that characterize competence formation stages during the mastering of academic program; methodical materials that define the procedures of estimation of knowledge, skills and experience that characterize competence formation stages.

The program is developed in compliance with the requirements of the FSES HE.

Developers:

Professor of Department of General and Clinical Pharmacology	S.B. Fitilev
Associate Professor of Department of General and Clinical Pharmacology	A.V. Vozzhaev
Associate Professor of Department of General and Clinical Pharmacology	I.I. Shkrebniova
Head of Department of General and Clinical Pharmacology	S.K. Zyryanov
Head of the Program	I.V. Radysh