

**DANYLO HALYTSKY LVIV NATIONAL MEDICAL UNIVERSITY**  
**Department of Endocrinology**



**"APPROVED"**

First Vice-Rector on  
Scientific and Pedagogical Work  
Associate Professor Iryna SOLONYNKO

"08" 05 2023 p.

**DISCIPLINE PROGRAM**

**"Age aspects of pharmacotherapy"**  
*(elective course)*

EC 1.66

Second (master's) level of higher education

Field of Knowledge 22 "Healthcare"

Specialty 222 "Medicine"

Faculty, year: Medical 5<sup>th</sup> year

Discussed and approved  
at the educational-methodical meeting  
of the Department of Endocrinology  
Minutes No 13 dated "27" April 2023  
Head of the Department

 Prof. Alina URBANOVYCH

Approved  
by the Profile Methodical Board on  
General Medicine Disciplines  
Minutes No 2 dated 04 May 2023  
Head of the Board

 Prof. Olena RADCHENKO

The discipline program "Age aspects of pharmacotherapy"(elective course)" was developed and imported at the Department of Endocrinology of Danylo Halytskyi Lviv National Medical University for the 5<sup>th</sup>-year students of Medical Faculty by the Specialty 222 "Medicine".

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**Changes and additions to the study program of the discipline during 2023-2024 academic year**

No	Content of changes (additions)	Minutes of the meeting of the Department, date	Notes
1.	Unchanged	No 13, 27 april 2023	

Chair of the Department of Endocrinology  
DMSc, prof. Urbanovych A.M.

Signature



## INTRODUCTION

A program of the discipline "**Age aspects of pharmacotherapy**" (optional) is compiled in accordance with the Standard of Higher Education of Ukraine (hereinafter - Standard) of the second (Master's) level

Field of Knowledge:

22 Healthcare

Specialty:

222 "Medicine," 228 "Pediatrics"

**Description of the discipline (annotation):** clinical pharmacology includes the study of groups of medicines, their main mechanisms of action, features of their pharmacokinetics, pharmacodynamics, manifestations of side effects and symptoms of overdose, main indications for appointment and interaction with other drugs.

Knowledge of clinical pharmacology is based on experimental data and theoretical concepts of pharmacology and other medical and biological sciences and on the actual material of clinical disciplines. The student must be able to develop a strategy and tactics for treating the disease in a particular patient and exercise dynamic control over the effectiveness and safety of drug therapy.

Teaching clinical pharmacology is the most optimal on the clinical therapeutic base, taking into account the etiology of the disease, the main pathogenetic mechanisms of its formation, the clinical picture, the appropriate drugs with their comparative analysis and the choice of the necessary.

The main task when teaching the subject should be preparation of a specialist with sufficient theoretical knowledge and practical skills for conducting the most rational drug therapy in a particular patient, who has mastered methodology of individual selection of effective and safe drugs on the basis of pharmacokinetics, pharmacodynamics, possible manifestations of side effects, peculiarities of the course of the disease, the age of the patient, optimal dosage, preparation of rational combinations.

According to the curriculum, the study of clinical pharmacology at the medical faculty is carried out within 9 or 10 semesters for the 5th year of study.

Structure of the discipline	Number of credits, hours			Year, semester	Type of assessment	
	In total	Classroom				IW
		lectures	practical classes			
<b>Discipline: Age-related aspects of pharmacotherapy</b>	<b>2 credits/ 60 hours</b>	<b>0</b>	<b>26</b>	<b>34</b>	<b>5<sup>th</sup> year (9<sup>th</sup> or 10<sup>th</sup> semester)</b>	

**The subject** of the discipline is medicines and their effects on the patient's body, clinical pharmacokinetics, clinical pharmacodynamics of medicines, methods for monitoring the effectiveness and safety of the use of drugs.

A set of processes that determine the interaction of a certain organism with medicines, is denoted as the system "body - drug." The study of this system in interaction with the environment is the methodological basis of modern clinical pharmacology.

**Interdisciplinary relations:** educational discipline "Clinical Pharmacology" is based on students' knowledge of medical biology, normal and pathological physiology, microbiology, medical chemistry, general pharmacology, clinical disciplines, laboratory and functional diagnostics and lays the foundations for the formation of ideas and skills of applying general principles of medical therapy of basic diseases, syndromes and their manifestations.

### 1. The purpose and objectives of the discipline

**1.1 The purpose of the discipline "Age aspects of pharmacotherapy"** is to train specialists who have a sufficient amount of theoretical knowledge and practical skills to conduct the most rational medical therapy for a particular patient, have a methodology for choosing the most effective and safe drugs as well as their combinations, taking into account individual characteristics of the patient, the course and form of the disease, the presence of concomitant pathology, based on evidence data.

**Final objectives of the discipline:**

- choose the necessary medicines, adequate dosage form and dosage regimen when prescribing patients with basic diseases of internal organs, depending on the age category of patients;
- determine group affiliation of medicinal products according to modern classifications;
- determine the manifestations of possible side effects and symptoms of overdose, methods of their prevention and treatment;
- determine the main methods of clinical examination of patients to assess the effectiveness and safety of prescribing medicines and analyze their results;
- determine pharmacodynamics and pharmacokinetics of drugs and their mechanisms of action;
- justify the main indications for appointment, adequate dosage form, ways of introduction and interaction with other medicines depending on age;

- to conduct a survey of patients in order to collect medical history and to predict the possibility of complications of pharmacotherapy.

**1.2 The main goals of studying the discipline "Age aspects of pharmacotherapy"** are to provide the student with a sufficient amount of theoretical knowledge and practical skills for conducting the most rational drug therapy in a particular patient, mastering the methodology of individual selection of effective and safe drugs on the basis of pharmacokinetics, pharmacodynamics, possible manifestations of side effects, peculiarities of the course of the disease, age of the patient, optimal dosage forms, compilation of rational combinations of drugs.

**1.3. Abilities and results of education** the formation of which the discipline contributes (interrelation with the normative content of training of higher education applicants, formulated in terms of study results in EPP).

According to the requirements of the EPP, the discipline ensures the acquisition of students

**competencies:**

- *integral:*

the ability to solve typical and complex specialized problems and practical problems in the field of health care, or in the process of training, which involves the conduct of research and/or implementation of innovations and is characterized by the complexity and uncertainty of conditions and requirements.

- *general:*

GC1. Be capable of abstract thinking, analysis and synthesis.

GC2. The ability to learn and master modern knowledge.

GC3. Ability to apply knowledge in practical situations.

GC4. Knowledge and understanding of the subject area and understanding of professional activities.

GC5. Ability to adapt and act in a new situation.

GC6. Ability to make informed decisions.

GC7. Ability to work in a team.

GC8. Ability to interpersonal interaction.

GC10. Ability to use information and communication technologies.

GC11. Ability to search, process and analyze information from different sources.

GC12. Determination and perseverance in relation to tasks and responsibilities.

GC13. Awareness of equal opportunities and gender issues.

GC14. Ability to realize their rights and responsibilities as a member of society, to realize the values of a civil (free democratic) society and the need for its sustainable development, rule of law, rights and freedoms of a citizen in Ukraine.

GC15. The ability to preserve and multiply moral, cultural, scientific values and achievements of society on the basis of understanding the history and patterns of the development of the subject area, its place in the general system of knowledge about nature and society and the development of society, technology and technology, to use different types and forms of motor activity for active recreation and a healthy lifestyle.

- *special (professional, subject):*

1. Ability to collect medical information about the patient and analyze clinical data.

6. Ability to determine the principles and nature of treatment and prevention of diseases.

11. Ability to solve medical problems in new or unfamiliar environments in the presence of incomplete or limited information taking into account aspects of social and ethical responsibility.

16. Ability to maintain medical documentation, including electronic forms.

21. To communicate their own knowledge, conclusions and arguments on health problems and related issues clearly and unambiguously to specialists and non-practitioners, in particular to persons who are studying.

24. Compliance with ethical principles when working with patients, laboratory animals.

25. Professional and academic integrity, responsibility for the accuracy of the obtained scientific results.

**Competence matrix**

<b>№</b>	<b>Classification of competencies byNFQ</b>	<b>Knowledge</b>	<b>Ability</b>	<b>Communication</b>	<b>Autonomy and responsibility</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Integral competence</b>					
The ability to solve typical and complex specialized problems and practical problems in a healthcare professional activity, or in a learning process that involves research and/or innovation and is characterized by the complexity and uncertainty of conditions and requirements.					
<b>General competence</b>					
1.	Capability of abstract thinking, analysis and synthesis.	Be aware of the ways to analyze, synthesize and expand their knowledge	Be able to analyze information, make informed decisions, be able to acquire new knowledge.	Establish appropriate connections to achieve goals.	To be responsible for timely acquisition of knowledge.
2.	The ability to	Know the current	To be able to	Establish appropriate	To be responsible

	learn and master modern knowledge.	trends in the development of the industry and analyze them.	analyze professional information, to make informed decisions, to acquire modern knowledge.	connections to achieve goals.	for the timely acquisition of modern knowledge.
3.	Ability to apply knowledge in practical situations.	Have specialized conceptual knowledge acquired in the learning process.	Be able to solve complex problems and problems that appear in professional activity.	Clear and unambiguous delivery of their own conclusions, knowledge and explanations to specialists and non-specialists.	Responsible for decision-making in difficult conditions.
4.	Knowledge and understanding of the subject area and understanding of professional activities.	Have deep knowledge of the structure of professional activity.	Be able to carry out professional activities that require updating and integrating knowledge.	Ability to effectively build communication strategy in professional activity.	Be responsible for professional development, the ability to further professional training with a high level of autonomy.
5.	Ability to adapt and act in a new situation.	Know the types and ways of adaptation, the principles of action in a new situation.	To be able to apply means of self-regulation, to be able to adapt to new situations (circumstances) of life and activity.	Establish appropriate links to achieve the result.	Be responsible for the timely use of self-regulation methods.
6.	Ability to make reasonable decisions.	Know the tactics and strategies of communication, laws and ways of communicative behavior.	Be able to make a reasonable decision, choose ways and strategies to ensure effective teamwork.	Use communication strategies and interpersonal interaction skills.	Be responsible for the choice and tactics of the way of communication.
7.	Ability to work in a team.	Know the tactics and strategies of communication, principles and ways of communicative behavior.	Be able to choose ways and strategies of communication to ensure effective teamwork.	Use communication strategies	Be responsible for the choice and tactics of the way of communication.
8.	Ability of interpersonal interaction.	Know the principles and ways of interpersonal interaction.	To be able to choose ways and strategies of communication for interpersonal interaction.	Use interpersonal interaction skills.	Be responsible for the choice and tactics of the way of communication.
10.	Ability to use information and communication technologies	Have deep knowledge in the field of information and communication technologies used in professional activities.	Be able to use information and communication technologies in the professional field, which requires updating and integrating of knowledge.	Use information and communication technologies in professional activities.	To be responsible for the development of professional knowledge and skills.
11.	Ability to search, process and analyze information from different sources.	Have knowledge of searching, processing and analyzing information from	Be able to find, process and analyze information from different sources.	Be able to share the found information	Responsible for the quality of the tasks.

		different sources.			
12.	Determination and perseverance in relation to tasks and responsibilities.	Know how to perform the tasks and responsibilities taken.	To be able to perform the tasks and the duties taken.	Ability to collectively perform tasks and responsibilities.	Responsible for the performance of tasks and responsibilities.
13.	Awareness of equal opportunities and gender issues.	Know gender problems.	To be able to solve gender problems.	Make suggestions to relevant bodies and institutions on equal opportunities and gender issues.	To be responsible for the implementation of measures to resolve gender problems.
14.	Ability to realize their rights and responsibilities as a member of society, to realize the values of a civil (free democratic) society and the need for its sustainable development, rule of law, rights and freedoms of a citizen in Ukraine.	Know your rights and responsibilities as a member of society, realize the values of a civil (free democratic) society and the need for its sustainable development, rule of law, rights and freedoms of a citizen in Ukraine.	To be able to realize their rights and responsibilities as a member of society, to realize the values of a civil (free democratic) society and the need for its sustainable development, rule of law, rights and freedoms of a citizen in Ukraine.	To be able to communicate with other members of society without violating their rights and obligations.	Responsibly realize their rights and responsibilities as a member of society, realize the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, rights and freedoms of a citizen in Ukraine.
15.	The ability to preserve and multiply moral, cultural, scientific values and achievements of society on the basis of understanding the history and patterns of the development of the subject area, its place in the general system of knowledge about nature and society and the development of society, technology and technology, to use different types and forms of motor activity for active recreation and healthy lifestyle.	Know how to preserve and multiply moral, cultural, scientific values and achievements of society on the basis of understanding the history and patterns of the development of the subject area, its place in the general system of knowledge about nature and society and the development of society and technology, use different types and forms of motor activity for active recreation and a healthy lifestyle.	To be able to preserve and multiply moral, cultural, scientific values and achievements of society on the basis of understanding the history and patterns of the development of the subject area, its place in the general system of knowledge about nature and society and the development of society, technology and technology, to use different types and forms of motor activity for active recreation and a healthy lifestyle.	Exchange moral, cultural, scientific values and achievements of society on the basis of understanding the history and patterns of the development of the subject area, its place in the general system of knowledge about nature and society and the development of society, technology and technology, use different types and forms of motor activity for active recreation and a healthy lifestyle.	Responsibly treat the storage and multiplication of moral, cultural, scientific values and achievements of society on the basis of understanding the history and regularities of the development of the subject area, its place in the general system of knowledge about nature and society and the development of society and technology, use different types and forms of motor activity for active recreation and a healthy lifestyle.
<b>Special (professional, subject) competences</b>					
1.	Ability to collect medical information about the patient and analyze clinical data.	Have specialized knowledge about the human body, its organs and systems, know the methods	Be able to conduct a conversation with the patient on the basis of algorithms and standards,	Effectively form a communication strategy when communicating with the patient.	Be responsible for the qualitative collection of information received on the

		and standard procedures of making inquiries and conducting a physical examination of the patient.	using standard techniques to conduct a physical examination of the patient. Be able to assess the state of human health.	Enter information about the state of human health to the relevant medical documentation.	basis of the inquiries, inspection, palpation, percussion of organs and systems and for timely assessment of the state: human health and for taking appropriate measures.
6.	Ability to determine the principles and nature of treatment of diseases.	Have specialized knowledge of algorithms and standard treatment schemes for diseases (according to list 2).	Be able to determine the principles and nature of treatment of the disease (according to list 2).	To form and convey to the patient and specialists their own conclusions on the principles and nature of treatment (according to the list 2).	Be responsible for making decisions on the principles and ways of treatment of the disease (list 2).
11.	Ability to solve medical problems in new or unfamiliar environments in the presence of incomplete or limited information taking into account aspects of social and ethical responsibility.	Know how to solve medical problems in new or unfamiliar environments with incomplete or limited information taking into account aspects of social and ethical responsibility	Be able to solve medical problems in new or unfamiliar environments with incomplete or limited information taking into account aspects of social and ethical responsibility	Use communication skills when solving medical problems in new or unfamiliar environments in the presence of incomplete or limited information taking into account aspects of social and ethical responsibility	To be responsible for a timely and up to par solution of medical problems in new or unfamiliar environments in the presence of incomplete or limited information taking into account aspects of social and ethical responsibility
16.	Ability to handle medical documentation, including electronic forms.	Know the system of official document management in the professional work of a doctor, including modern computer information technologies.	Be able to determine the source and location of the necessary information depending on its type.	Receive the necessary information from a certain source and, on the basis of its analysis, form appropriate conclusions.	Be responsible for the completeness and quality of the analysis of information and conclusions on the basis of its analysis.
21.	To communicate their own knowledge, conclusions and arguments on health problems and related issues clear and unambiguously to specialists and non-practitioners, in particular to persons who are studying.	Have knowledge of healthcare issues and issues related to specialists and non-practitioners, in particular to persons who are studying.	To be able to clearly and unambiguously communicate their own knowledge, conclusions and reasoning on health problems and issues related to specialists and non-practitioners, in particular to persons who are studying.	To be able to communicate their own knowledge, conclusions and arguments on health problems and issues related to specialists and non-practitioners, in particular to persons who are studying in a clear and unambiguous way.	Responsibly, clearly and unambiguously communicate their own knowledge, conclusions and reasoning on health problems and issues related to specialists and non-practitioners, in particular to persons who are studying.

24.	Compliance with ethical principles when working with patients, laboratory animals.	Know the ethical principles when working with patients, laboratory animals.	Be able to adhere to ethical principles when working with patients, laboratory animals.	Be able to adhere to ethical principles when working with patients, laboratory animals.	Responsibly adhere to ethical principles when working with patients, laboratory animals.
25.	Maintain professional and academic integrity, be responsible for the accuracy of the obtained scientific results.	Know the rules of professional and academic integrity, responsibility for the accuracy of the obtained scientific results.	Be able to maintain professional and academic integrity, responsibility for the accuracy of the obtained scientific results.	Be able to maintain professional and academic integrity, responsibility for the reliability of the obtained scientific results when working in a team.	Be responsible for the maintaining of professional and academic integrity, responsibility for the accuracy of the obtained scientific results.

### Training results for the discipline

According to the requirements of the Standard, students must:

#### **Know:**

- The main ways of pharmacological correction of diseases, disorders of organs and systems.
- Nomenclature and classification of medicines.
- Pharmacological and pharmacotherapeutic characteristics of the main groups of medicines.
- Indications and contraindications to the use of medicines
- Manifestations of possible adverse reactions of medicines, symptoms of overdose with potent and poisonous drugs, methods of their prevention and principles of treatment.

#### **Be able to:**

- Prescribe and analyze prescriptions for medicinal products in various forms in accordance with the current legislation of Ukraine.
- To determine group affiliation of medicines according to modern classifications;
- Provide pharmacological and pharmacotherapeutic characteristics to medicines, build logical connections between the mechanism of action and pharmacodynamics, pharmacodynamics and indications, side effects and contraindications to their use;
- Calculate a single dose of the drug depending on the age, body weight or surface area of the patient;
- To determine, depending on the peculiarities of pharmacokinetics, the multiplicity of the drug, its daily, course dose in patients of different ages in accordance with concomitant diseases and the use of other drugs;
- Justify an adequate dosage form in accordance with the methods of administration
- Predict the effects of the interaction of medicines with their combined administration, medicines and components of food, medicines and alcohol;
- Evaluate the benefit/risk ratio when using medicines;
- To make judgments about the possibility of adverse reactions of medicines in order to prevent them;
- To identify manifestations of possible adverse reactions of medicines, symptoms of overdose with potent and poisonous drugs, methods of their prevention and principles of treatment;
- To create an algorithm for helping patients with acute drug poisoning using antidotes in each case;
- Analyze pharmacological information in modern reference books, scientific and professional periodicals;
- Provide comparative characteristics of medicines in terms of effectiveness, safety, mechanism of action, indications for use, etc.;
- Provide rational pharmacotherapeutic care for the most common urgent conditions found in the clinic of internal diseases.

Training program results:

PRT 1. Thorough knowledge of the structure of professional activity. Ability to carry out professional activities that require updating and integrating knowledge. Responsibility for professional development, the ability to further professional training with a high level of autonomy.

PRT 2. Understanding and knowledge of fundamental and clinical biomedical sciences, at a level sufficient for solving professional health problems.

PRT 3. Specialized conceptual knowledge, including scientific achievements in the field of health care and is the basis for research, critical understanding of problems in the field of medicine and interdisciplinary problems.



PRT 4. To select and identify leading clinical symptoms and syndromes (according to list 1); according to standard methods, using preliminary data of the patient's history, data of the patient's examination, knowledge about the person, his organs and systems, establish a preliminary clinical diagnosis of the disease (according to list 2).

PRT 5. Collect complaints, history of life and diseases, evaluate psychomotor and physical development of the patient, state of organs and systems of the body, based on the results of laboratory and instrumental studies, evaluate information regarding the diagnosis (according to list 4), taking into account the age of the patient.

PRT 6. To establish a final clinical diagnosis by making a reasoned decision and analyzing the received subjective and objective data of clinical, additional examination, carrying out differential diagnosis, observing the relevant ethical and legal norms, under the control of the head physician in the conditions of the health care institution (according to the list ). 2).

PRT 7. To assign and analyze additional (mandatory and optional) examination methods (laboratory, functional and/or instrumental) (according to list 4) of patients with diseases of organs and body systems for differential diagnosis of diseases (according to list 2).

PRT 8. To determine the main clinical syndrome or what causes the severity of the victim/victim's condition (according to list 3) by making a reasoned decision and assessing the person's condition under any circumstances (in the conditions of a health care facility, outside its borders), including in conditions of emergency and hostilities, in field conditions, in conditions of lack of information and limited time.

PRT 9. To determine the main clinical syndrom and principles of treatment of patients (conservative, surgical) with diseases (according to the list 2), taking into account the age of the patient, in a health institution, outside and at the stages of medical evacuation, including in the field, on the basis of a preliminary clinical diagnosis, adhering to the relevant ethical and legal norms, by making a reasonable decision on existing algorithms and standard schemes, if it is necessary to expand the standard scheme to be able to justify personalized recommendations under the supervision of a supervisor in a medical institution.

PRT 10. To determine the required work mode, rest and nutrition on the basis of the final clinical diagnosis, observing the relevant ethical and legal norms, by making a reasoned decision according to existing algorithms and standard schemes.

PRT 11. To determine the approach, plan and tactics of managing a physiological illness, physiological childbirth and the postpartum period by making a reasoned decision according to existing algorithms and standard schemes.

PRT 12. To assess the general condition of a newborn child by making a reasoned decision according to existing algorithms and standard schemes, observing the relevant ethical and legal norms.

PRT 13. To assess and monitor the child's development, provide recommendations on feeding and specifics of nutrition depending on age, organize preventive vaccinations according to the calendar.

PRT 14. To determine tactics and provide emergency medical care in emergency situations (according to list 3) in limited time in accordance with existing clinical protocols and treatment standards.

PRT 15. To organize the provision of medical aid and medical evacuation measures to the population and military personnel in emergency situations and hostilities, including in field conditions.

PRT 16. To form rational medical routes for patients; organize interaction with colleagues in their own and other institutions, organizations and institutions; to apply tools for the promotion of medical services in the market, based on the analysis of the needs of the population, in the conditions of the functioning of the health care institution, its division, in a competitive environment.

PRT 17. To perform medical manipulations (according to list 5) in the conditions of a medical institution, at home or at work based on a previous clinical diagnosis and/or indicators of the patient's condition after making a reasoned decision, observing the relevant ethical and legal norms.

PRT 20. To analyze the epidemiological situation and carry out measures for mass and individual, general and local prevention of infectious diseases.

PRT 21. To search for the necessary information in the professional literature and databases of other sources, analyze, evaluate and apply this information.

PRT 22. Application of the modern digital technologies, specialized software, statistical data analysis methods to solve complex health problems.

PRT 24. Organization of the necessary level of individual security (own and persons who are cared for) in case of typical dangerous situations in an individual field of activity.

PRT 25. Communicating their own knowledge, conclusions and arguments on health problems and related issues to specialists and non-practitioners in a clear and unambiguous way.

PRT 26. To manage work processes in the field of health care, which are complex, unpredictable and require new strategic approaches, organize the work and professional development of personnel taking into account the acquired skills of effective teamwork, leadership positions, appropriate quality, accessibility and justice, ensuring the provision of integrated medical help.

PRT 27. Fluent communication in the official language and English, both orally and in writing to discuss professional activities, research and projects.

PRT 28. To make effective decisions about health care problems, assess the necessary resources, use social, economic and ethical research.

PRT 29. To plan, organize and carry out measures for the specific prevention of infectious diseases, including in accordance with the National calendar of preventive vaccinations, both mandatory and recommended. Manage vaccine residues, organize additional vaccination campaigns, including immunoprophylaxis measures.

## **2. Information scope of educational discipline**

Discipline "Age aspects of pharmacotherapy", 2 credits of ECTS, 60 hours

The purpose of the course: to provide motivation for students to internalise and master specific materials on special issues of clinical pharmacology, to give a methodology for choosing pharmacological groups and specific drugs, taking into account the data of pharmacokinetics, pharmacodynamics, interaction and side effects depending on the state and age of the patient.

Course objectives:

- to present an integral system of theoretical foundations of clinical pharmacology; factors contributing to the occurrence of changes in metabolism, the action of drugs, increase the risk of side effects;
- to outline ways to implement the main issues of clinical pharmacology in patients;
- to study pharmacokinetic parameters of drugs;
- to study pharmacodynamic parameters of drugs;
- to evaluate the possibility of drug interaction;
- to predict side effects;
- to study the relationship between pharmacokinetics and pharmacodynamics of drugs;
- to study the features of pharmacokinetics, pharmacodynamics of drugs, depending on the functional state of the biological system (age, pregnancy, etc.);
- to teach the selection of the most effective and safe drugs;
- to determine the optimal dosage regime, choose the right method of administration taking into account the pharmacokinetic and pharmacodynamic parameters of drugs, as well as the age of the patient, sex and clinical condition of the patient;
- to assign an effective and safe combination of drugs in a specific clinical situation;
- to predict and detect in the early stages side effects of drugs and to perform its correction;
- to take into account the risk factors and clinical manifestations of side effects of drugs in monotherapy and in combination with drugs of another mechanism of action.

These objectives can be achieved only when students master the skills of clinical diagnostic thinking in the main nosological units of human pathology and fundamental disciplines (pharmacology, therapy, pediatrics, surgery, obstetrics and gynecology and other clinical disciplines).

### **Topic 1.**

#### **Clinical pharmacokinetics depending on age.**

Absorption processes, ways of administration, distribution, metabolism, withdrawal of medicines depending on age.

### **Topic 2.**

#### **Pharmacodynamics of medicines in the age-related aspect.**

Mechanism of action, character, strength, duration of pharmacological effects of drugs in different age categories.

### **Topic 3. Clinical pharmacogenetics.**

The role of genetic factors in the formation of pharmacological response to medicines.

### **Topic 4. Side effects of drugs in the age-related aspect.**

Methods of evaluation and criteria of effectiveness and safety of medical therapy. Possible complications of drug therapy depending on age. Diagnosis, correction and prevention of adverse reactions.

### **Topic 5.**

#### **Interaction of medicines depending on the age of the patient.**

Features of the appointment of different groups of drugs, taking into account their interaction. Principles of combination and dosage of drugs depending on age.

### **Topic 6.**

#### **Basic principles of pharmacotherapy in the aspect of age-related features.**

Features of the choice of drugs, their dosage in patients of different age categories. Evaluation of effectiveness and safety of application.

### **Topic 7.**

#### **Features of clinical pharmacotherapy against the background of pregnancy.**

Peculiarities of choice, appointment, dosage, combination of medicines during pregnancy. Evaluation of the effectiveness and safety of the use of drugs in pregnant women.

### **Topic 8.**

#### **Features of clinical pharmacotherapy against the background of lactation.**

Peculiarities of choice, appointment, dosage, combination of medicines during lactation. Evaluation of the effectiveness and safety of the use of drugs in lactating women.

### **Topic 9.**

#### **Features of clinical pharmacotherapy in infants.**

Peculiarities of choice, prescription, dosage of medicines in infants. Side effects of drugs on the baby's body.

### **Topic 10.**

#### **Features of clinical pharmacotherapy in childhood.**

Peculiarities of choice, appointment, dosage of medicines in childhood. Side effects of drugs on the child's body.

**Topic 11.**

**Features of clinical pharmacotherapy in adolescence.**

Peculiarities of choice, prescription, dosage of medicines in adolescence. Side effects of drugs on the child's body.

**Topic 12.**

**Features of clinical pharmacotherapy in old age.**

Features of choice, appointment, dosage of medicines in old age. Side effects of drugs on the body of the elderly.

**Topic 13. Issues of ethics, deontology, medical and legal issues of clinical pharmacology in the age-related aspect.**

Medical-legal and medical-deontological issues of clinical studies in the age aspect.

**3. STRUCTURE OF EDUCATIONAL DISCIPLINE  
"Age aspects of pharmacotherapy"**

Names of modules and topics	Hours					
	Daily form					
	Total	Specifically				
L		P	Lab	Pers.	IW	
1	2	3	4	5	6	7
Clinical pharmacokinetics depending on age.		0	2			2,5
Pharmacodynamics of medicines in the age-related aspect.		0	2			2,5
Clinical pharmacogenetics		0	2			2,5
Side effects of drugs in the age-related aspect.		0	2			3
Interaction of medicines depending on the age of the patient.		0	2			3
Basic principles of pharmacotherapy in the aspect of age-related features.		0	2			2,5
Features of clinical pharmacotherapy against the background of pregnancy.		0	2			2,5
Features of clinical pharmacotherapy against the background of lactation.		0	2			2,5
Features of clinical pharmacotherapy in infants.		0	2			2,5
Features of clinical pharmacotherapy in childhood.		0	2			2,5
Features of clinical pharmacotherapy in adolescence.		0	2			2,5
Features of clinical pharmacotherapy in old age.		0	2			3,0
Issues of ethics, deontology, medical and legal issues of clinical pharmacology in the age-related aspect		0	2			2,5
Together with the content module hours/credits ECTS	60/2	0	26			34

Note. In classroom - 43.3%, independent studying- 56.7%.

**4. List of lectures on the subject**

Lectures on discipline according to the curriculum are not provided.

**5. List of practical classes**

<i>Nº</i>	<i>Topic</i>	<i>Hours</i>
1.	Clinical pharmacokinetics depending on age.	2
2.	Pharmacodynamics of medicines in the age-related aspect.	2
3.	Clinical pharmacogenetics	2
4.	Side effects of drugs in the age-related aspect.	2
5.	Interaction of medicines depending on the age of the patient.	2
6.	Basic principles of pharmacotherapy in the aspect of age-related features.	2
7.	Features of clinical pharmacotherapy against the background of pregnancy.	2
8.	Features of clinical pharmacotherapy against the background of lactation.	2
9.	Features of clinical pharmacotherapy in infants.	2

10.	Features of clinical pharmacotherapy in childhood.	2
11.	Features of clinical pharmacotherapy in adolescence.	2
12.	Features of clinical pharmacotherapy in old age.	2
13.	Issues of ethics, deontology, medical and legal issues of clinical pharmacology in the age-related aspect	2
	<b>In total</b>	<b>26</b>

## 6. Types of independent work of students.

### 7. Individual tasks

<i>Nº</i>	<i>Topic</i>	<i>Hours</i>	<i>Type of control</i>
1.	Preparation for practical classes	26	Current control in practical classes
2.	Preparation and writing of abstracts, presentations	8	Presentation of abstracts at a practical lesson
	<b>In total</b>	<b>34</b>	

### 8. Teaching methods.

The types of educational activities of students according to the curriculum are:

- a) practical classes,
- b) independent work of students.

Training sessions on the methodology of their organization are practical, because they provide for the following organizational structure:

1. Preparatory stage (organizational, setting educational goals and their motivation, control of the initial level of knowledge).
2. The main stage (formation of professional skills and skills in determining the general principles of pharmacokinetics, pharmacodynamics, prescription, solving typical pharmacotherapeutic problems and test tasks).
3. The final stage (control of the final level of knowledge and skills, solving atypical problems, test tasks). Summing up the overall results. Tasks for the next classes.

#### Plan and organizational structure of lessons on discipline "Age aspects of pharmacotherapy"

<i>Nº</i>	<i>Stages</i>	<i>Duration</i>	<i>Tools</i>	<i>Equipment</i>
<b>1.</b>	<b>Preparatory stage</b>	<b>25 min</b>		
1.1.	Organizational issues	5 min		
1.2.	Checking tasks that were set for independent preparation for classes	10 min	Tutorial, tutorial	
1.3.	Control and evaluation of the entry level of students in pharmacology	10 min	Methodical developments of the department	
<b>2.</b>	<b>The main stage</b>	<b>40 min</b>		
2.1.	Formation of professional skills (correction of prescriptions, control of determination by the student of group belonging of drugs, basic indications for the prescription of drugs) of possible side effects of medicines and their correction. Solution of pharmacotherapeutic problems, curation of specialized patients.	30 min	Tutorial, manual, tables, stands, disease stories, letters of medical appointments	Projector multi-media, laptop, board
2.2.	Solution of situational problems and their assessment	10 min	Tutorial, tutorial, tables	
<b>3.</b>	<b>The final stage</b>	<b>25 min</b>		
3.1.	Final level test control	10 min	Methodical developments of the department (clinical pharmacology tests for final control)	
3.2.	General assessment of students "educational activities	10 min	Criteria for assessing students knowledge	
3.3.	Organizational issues. The task for independent preparation for the next lesson.	5 min	Thematic plan, methodological development of practical classes and independent work of the student.	

The educational activities of students are controlled at practical lessons during the current control according to specific goals and during the individual work of the teacher with the student. It is recommended to use the

following means of diagnosing the level of preparation of students: tests, solving situational problems, prescriptions, determining the affiliation of drugs to the pharmacological and pharmacotherapeutic group according to the international classification, possible indications for use; analysis and evaluation of criteria for the effectiveness and safety of the use of medicines to a particular patient. During practical classes, audiovisual means of training used are: tables, slides, collections of medicines, beginning films, computer equipment and others. It is mandatory at every practical lesson clinical analysis of the patient on the topic of occupation. This involves: formulating a preliminary diagnosis, prescribing the necessary treatment, indications and contraindications to the appointment of a particular drug, clinical manifestations of drugs of this group, negative manifestations of drugs of this group, the interaction of various drugs, analysis and evaluation of the results of instrumental studies and parameters characterizing changes in the function of the human body under the influence of the drug.

The final control of the mastering of each lesson, the control of practical skills is carried out upon its completion.

### **Tasks for independent studying**

The task for independent work includes studying of the topics according to the plan of practical classes. The topics of independent studying should include different facets of the action of drugs, or groups of drugs with detailed processing of pharmacodynamics and pharmacokinetics of medicines, differences in the action of different drugs within the same group; details of side effects of medicines; synergism of drugs of different groups for achievements of specific therapeutic effects depending on age. Creating and presenting multimedia presentations.

### **Individual tasks**

Detailed study of topics, writing abstracts, abstracts and reports for participation in scientific conferences of students and young scientists. Creating educational videos with a teacher. Create multimedia presentations, supervisory schemes in the form of tables and electronically using the Paver Point editor for lesson topics. Production of tools for illustrating training (stands, tables, etc.). Participation in professional student olympiads in the discipline and competitions of creative works.

The study of the subject ends with a test. The assessment of the student's achievement in the discipline is a rating and has a definition on a multi-scale, an ESTS system and a 4-point traditional scale adopted in Ukraine.

## **9. Control methods**

In order to intensify the educational process, systematically assimilate educational material, establish feedback with each student, timely control and correction of the educational process, increase motivation, reduce the omissions of educational classes, students' responsibility for the results of educational activities, the success of each student is evaluated according to the rating system.

Evaluation is one of the final stages of educational activity and determining the success of learning. The discipline score is set as an average of grades for current educational activities, which is exhibited when evaluating theoretical knowledge and practical skills in accordance with the lists determined by the discipline program.

**10. Current control is carried out** on practical exercises in accordance with specific goals. Following means of diagnostics of the level of preparation of students are recommended: test control (machine and machine-based), solution of situational problems, control of practical skills, in particular - the ability to properly conduct the patient's curation, assign and interpret the results of laboratory and instrumental examination, justify the diagnosis on the basis of analysis of clinical and auxiliary methods of examination.

When marking students' progress in studying each topic of the module, students are given grades on a 4-point (traditional) scale using the criteria of evaluation adopted in universities and approved by the cycle medical commission. This takes into account all types of work provided for by methodological development for the study of the topic.

### ***Criteria for assessing knowledge in the discipline of clinical pharmacology***

1. In the practical lesson, the student receives the mark "**excellent**":
  - If the student has shown full knowledge of the topic and has given complete and correct answers to the questions asked by the teacher.
  - Performs correction of the prescription leaves with explanations of the need for appointment or exclusion from the treatment regimen of the patient with a separate nosological form of specific medicines, their dosage, ways of administration, etc.
  - Freely oriented in group affiliation, mechanisms of action, side effects, indications and contraindications to the use of the drugs.
  - Clearly carries out the choice of medicines for urgent conditions, criteria for evaluating the effectiveness and safety of use.
2. The student receives the mark "**good**" if he/she:
  - Knows the subject studied in full complexity.
  - Gives correct but not quite full answers to additional questions, provides answers with the help of the teacher.

- Conducts the correction of the prescription leaves but does not always provide explanations of the need for appointment or exclusion from the treatment regimen of the patient with a separate nosological form of specific medicines, their dosage, ways of administration, etc.
  - Well aware of doses and group affiliation, mechanisms of action, side effects, indications and contraindications to the use of drugs on the topic under study.
3. The student receives the mark "**satisfactory**" if:
- The question is answered only with the help of the teacher, he/she does not always correctly focus on the mechanism of action of drugs, does not give a full list of indications and contraindications to the use of drugs.
  - Not always corrects the prescription leaves correctly without explaining the need for appointment or exclusion from the treatment regimen of the patient with a separate nosological form of specific medicines, their dosage, ways of administration, etc.
4. The mark "**unsatisfactory**" is received by a student who:
- Cannot answer all questions even with the help of the teacher.
  - Does not correct the leaves of the appointment.
  - Additional questions are not answered, according to which the answer can be assessed as "satisfactory."

The student can make up for the missed topics but no more than 3 times, thereby getting the number of points more than the minimum to receive a credit on the discipline. Evaluation of the current educational activities: carried out at each practical class on the relevant topic and has a definition according to the ESTS system and the traditional scale adopted in Ukraine

For each topic students are given grades on a 4-point traditional scale, then for each student his average score is calculated for the discipline and according to Table 1 "Instructions for assessing the educational activities of students... "is converted to the appropriate points."

The independent studying of students, which is provided in the topic along with the audit work, is evaluated during the current control of the topic at the appropriate lesson. The assimilation of topics, which are made only for independent studying, is controlled at the credits lesson.

The maximum number of points a student can score for the current educational activity in the study of the discipline is 200 points, the minimum - 120 points.

### **11. Summer control.**

A semester test is a form of final control, which consists in assessing the student's mastering of the discipline's educational material solely on the basis of the results of performing all types of educational work provided for by the curriculum. The semester test is issued according to the results of the current control.

The assessment of the student's achievement in the discipline is provided by a rating and set on a multi-scale as an average arithmetic assessment of the assimilation of the corresponding modules and has a definition by the ESTS system and the traditional scale adopted in Ukraine.

### **12. The formula according to which students receive points**

The calculation of the number of points for the current training is carried out on the basis of the grades received by the student on a 4-point (national) scale during the study of the discipline, by calculating the arithmetic mean (AM), rounded up to 2 characters after the decimal point. The resulting value is converted to points on a multi-point scale as follows:

$$X = (AM \times 200) : 5$$

**Recalculation of the average mark for current activities into a multi-point scale for disciplines ending with a credit:**

4-Point scale	200-Point scale
5	200
4.97	199
4.95	198
4.92	197
4.9	196
4.87	195
4.85	194
4.82	193
4.8	192
4.77	191
4.75	190
4.72	189
4.7	188
4.67	187
4.65	186
4.62	185
4.6	184
4.57	183
4.52	181
4.5	180
4.47	179

4-point scale	200-point scale
4.45	178
4.42	177
4.4	176
4.37	175
4.35	174
4.32	173
4.3	172
4.27	171
4.24	170
4.22	169
4.19	168
4.17	167
4.14	166
4.12	165
4.09	164
4.07	163
4.04	162
4.02	161
3.99	160
3.97	159
3.94	158

4-point scale	200-point scale
3.92	157
3.89	156
3.87	155
3.84	154
3.82	153
3.79	152
3.77	151
3.74	150
3.72	149
3.7	148
3.67	147
3.65	146
3.62	145
3.57	143
3.55	142
3.52	141
3.5	140
3.47	139
3.45	138
3.42	137
3.4	136
3.37	135
3.35	134

4-point scale	200-point scale
3.32	133
3.3	132
3.27	131
3.25	130
3.22	129
3.2	128
3.17	127
3.15	126
3.12	125
3.1	124
3.07	123
3.02	121
3	120
Less than 3	Unsatisfactory

***Evaluation of individual tasks of the student.***

The independent studying of students, which is provided in the topic along with studying in the classroom, is evaluated during the current control of the topic at the appropriate lesson. The assimilation of topics, which are made only for independent studying, is controlled at the creditclass. The implementation of individual tasks is taken into account when deriving an assessment for a practical lesson in the conditions of their successful execution and confirmation. In no case can the total score for the current training activity exceed 200 points.

**The maximum number of points** a student can score for the current educational activity in the study of the discipline is 200 points.

**The minimum number of points** a student must score for the current educational activity in studying the discipline is 120 points.

**The assessment** of the student's achievement in the discipline is rated on a multi-scale as an average arithmetic assessment of the assimilation of the corresponding modules and has a definition by the ESTS system and the traditional scale adopted in Ukraine.

The score for the discipline on a 200-point scale is formed by adding the amount of points for the current student's educational activity and final control. The score on the 200-point scale is transformed into an estimate on the traditional (four-point) scale and after ranking - in assessment on the ECTS scale.

Objectivity of evaluation of students "educational activity should be checked by statistical methods (correlation coefficient between current success and results of final control).

According to the decision of the Academic Council of the University to the number of points scored by the student from the discipline "Internal Medicine, including endocrinology, medical genetics," encouraging points (not more than 12 points) for taking prizes at international and all-Ukrainian subject Olympiads can be added, but in no case the total score for the discipline can exceed 200 points.

**Conversion of the number of points for semester control in the evaluation on the ECTS scale and on the four-point (traditional) scale.**

Points for semester control are independently converted to both the ECTS scale and the four-point scale. Points of the ECTS scale to the four-point scale are not converted and vice versa.



Students who study in one course in one specialty, based on the number of points scored for semester control, are ranked on the ECTS scale as follows:

ECTC	Statistical indicator
«A»	Top 10% of students
«B»	Next 25% of students
«C»	Next 30% of students
«D»	Next 25% of students
«E»	Last 10% of students

Rating with the assignment of grades "A," "B," "C," "D," "E" is carried out by deans or other structural subdivision by the decision of the academic council educational department for students of this course who study in one specialty and have successfully completed the study of the discipline. Ranking of students - citizens of foreign countries is recommended by the decision of the Academic Council to conduct in the same array with students - citizens of Ukraine who study in the same specialty.

Students who have received "FX" and "F" ("2") grades are not included in the list of students who are graded even after the module has been reassigned. Such students automatically receive an "E" score after overpayment.

Grades in the discipline "FX," "F" ("2") are presented to students who are not enrolled at least one module in the discipline after completing its study.

The score "FX" is given to students who have scored the minimum number of points for the current educational activity, but who are not credited with the final control of the module. This category of students has the right to re-assign the final control over the approved schedule (but not later than the beginning of the next semester). Re-taking of the final test is allowed no more than two times.

The grade "F" is given to students who have attended all classes from the module, but have not scored a minimum number of points for current educational activities and are not allowed to complete control. This category of students has the right to re-study the module.

With dean's permission the student can increase the assessment of the discipline by reassigning the final control (no more than three times for the entire period of study).

Semester test scores of students who have successfully completed the discipline program are also converted by the department to a traditional four-point scale according to the absolute criteria as below in the table.

Points	Grade on a 4-point scale
170 - 200 points	«5»
140 - 169 points	«4»
139 - 120	«3»
< 120	«2»

The evaluation of ECTS to the traditional four-point scale is NOT converted because the ECTS scale and the four-point scale are **independent**.

The multibal and four-point scales characterize the actual success of each student in assimilating the discipline. The ECTS scale is a relative, comparative, rating that determines the student's belonging to the group of the best or the worst among the reference group of classmates (faculty, specialty). Therefore, the score "A" on the scale can not be equal to the estimate "excellent," and the score "B" - the assessment "good," etc. As a rule, when converting from a multibal scale, the boundaries of grades "A," "B," "C," "D," "E" on the ECTS scale do not coincide with the boundaries of the grades "5," "4," "3" on the traditional scale.

### 13. Methodological support

- Curriculum of the subject
- Plans for practical classes and independent work of students
- Methodological guidelines for practical classes for students
- Methodological guidelines for practical classes for teachers
- Methodological materials that ensure the student's work
- Test and control tasks for practical classes
- Situational tasks for practical classes
- Virtual history of diseases
- List of medicines for studying and writing prescriptions

### 14. Recommended literature:

#### Main:

1. Clinical Pharmacology and Therapeutics: 2020 in Review. /Editorial Piet H. van der Graaf. - 13 November 2020.
2. Clinical Pharmacology (Quick Look Series) 1st Edition. Cynthia Webster. March 1, 2001. – 150p.

3. A Textbook of Clinical Pharmacology and Therapeutics, 5Ed (A Hodder Arnold Publication) 5th Edition. James Ritter, Lionel Lewis, Timothy Mant, Albert Ferro. April 25, 2008. – 476p.
4. Applied Pharmacology: With STUDENT CONSULT Online Access 1st Edition. Stan Bardal, Jason Waechter, Doug Martin. November 24, 2010. - 480p.
5. Clinical pharmacology applications in clinical drug development and clinical care: A focus on Saudi Arabia. / Abdullah Alsultan, Wael A Alghamdi, Jahad Alghamdi, Abeer F Alharbi, Abdullah Aljutayli, Ahmed Albassam, Omar Almazroo, Saeed Alqahtani. Epub 2020 Oct;28(10):1217-1227. doi: 10.1016/j.jsps.2020.08.012.
6. Geriatric Pharmacology: The Principles of Practice & Clinical Recommendations, Second Edition. Steven Atkinson. October 18, 2016. – 166p.
7. Clinical Ocular Pharmacology 5th Edition. Jimmy D. Bartlett, Siret D. Jaanus. November 26, 2007. – 816p.
8. Brody's Human Pharmacology: Molecular to Clinical With STUDENT CONSULT Online Access (HUMAN PHARMACOLOGY (BRODY)) 4th Edition. Kenneth Minneman. February 25, 2004. – 775p.

Additional:

1. Basic and Clinical Pharmacology 12/E (LANGE Basic Science) 12th Edition. Bertram G. Katzung, Susan B. Masters, Anthony J. Trevor. January 3, 2012. - 1248p.
2. Handbook of Drug Interactions: A Clinical and Forensic Guide Softcover reprint of the original 2nd ed. 2012 Edition. Ashraf Mozayani, Lionel Raymon. August 23, 2016. -839p.
3. Clinical Pharmacology Simplified. Solomon Barroa RN. March 7, 2015. -343p.
4. Disease Management: A Guide to Clinical Pharmacology 3rd Revised edition. Dr Michael D. Randall, Dr Karen E. Neil. August 1, 2016. – 496p.
5. Introduction to Clinical Pharmacology 8th Edition. Marilyn Winterton Edmunds. February 6, 2015. – 496p.
6. Applications of Clinical Pharmacology in Drug Development 1st Edition. Mark Avis. May 24, 2016. – 238p.
7. Clinical Pharmacology and Practical Prescribing on the Move (Medicine on the Move) 1st Edition. James Turnbull, Matthew Tate, Peter Jackson. May 6, 2016. – 352p.
8. Roach's Introductory Clinical Pharmacology (Lippincott's Practical Nursing) Study Guide Edition. R.N. Ford, Susan M., R.N. Roach, Sally S. October 4, 2013. -391p.
9. Bioequivalence and Statistics in Clinical Pharmacology (Chapman & Hall/CRC Biostatistics Series) 2nd Edition. Scott D. Patterson, Byron Jones. December 20, 2016. -460p.
10. Clinical Pharmacology: Current Topics and Case Studies 2nd ed. 2016 Edition. Markus Müller. March 25, 2016. – 411p.
11. Clinical Pharmacology Made Incredibly Easy 1st Edition. Springhouse. October 1, 2000. – 376p.
12. INTRODUCTION TO BASIC AND CLINICAL PHARMACOLOGY: FIRST EDITION. Dr. Amal Kumar Dhara. April 15, 2021. – 566p.

**13. Informational resources:**

1. <https://doi.org/10.1002/cpt.2061>
2. <https://www.clinicaltrials.gov/>
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2909801/>
4. <http://www.medscape.org>
5. <http://www.osdm.org/index.php>
6. <http://www.eacpt.org>
7. <https://www.ema.europa.eu>
8. Resource for forecasting interdisciplinary interactions (based on FDA instructions, in English) URL: <http://www.drugs.com>
9. 3.Resource-dispenser of medicinal means and prognosis of interdisciplinary interactions (in English). URL: <http://www.medscape.org>.
10. European Society of Clinical Pharmacologists and Pharmacotherapists: <http://www.eacpt.org>.