MINISTRY OF HEALTH, LABOUR AND SOCIAL PROTECTION OF THE REPUBLIC OF MOLDOVA
„NICOLAE TESTEMIŢANU" STATE UNIVERSITY OF MEDICINE AND PHARMACY

THE DEPARTMENT OF PHARMACOLOGY AND CLINICAL PHARMACOLOGY

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Pharmacology
Methodological guideliness

Chişinău
The Design and Polygraph Center „Medicine"
2019

CZU 6.15 (075.8)
M 30

Approved by *„Nicolae Testemiţanu”*
State University of Medicine and Pharmacy
Central Methodology Council

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Computerized layout design:

CIP description of the National Book Chamber in the Republic of Moldova
Course outline of the pharmacology department in „*Nicolae Testemiţanu”* State University of Medicine and Pharmacy. Department of pharmacology and clinical pharmacology; elab/Victor Ghicavîi, Nicolae Bacinschi, Ecaterina Stratu, Ina Pogonea, Ianoş Coreţchi, Tatiana Chiriac, Ina Guţu, Olesea Popovici, Galina Spînosu, Carolina Catcov, Tatiana Rakovskaia, Marin Chianu – Ed. II-a, Copy-edited- Ch: Centrul Ed.-Poligrr. Medicina, 2016, p.
ISBN 9975-9588-8-5
1000
ex.

ISBN 9975 – 907 – 350

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INTRODUCTION

This course's outline conforms to the requirements posed by the current programme of study in our university „Nicolae Testemiţanu State University of Medicine and Pharmacy" for third year medical studies, which reinforces certain teaching strategies, allowing to teach pharmacology in an effective, informative and a uniform fashion, directed to accomplish 3 main objectives.

The first objective serves to familiarize the students with the topic encopassed during the lesson, as well as to maintain a high level of efficiency as to allow both the teacher to meet his teaching goals, and the students to acquire a proper learning experience, all serving to promote and motivate the students to study and deepen their knowledge.

The second objective represents the integration of the different medical disciplines, and how they relate to pharmacology, i.e. how the morphological, physiological, biochemical, and pathophysiological peculiarities are taken advantage of in the field of pharmacology.

Finally, the third objective requires the student to take an active part in the learning process and to answer questions designated especially for practicing, to classify and characterize common features of various groups of drugs, and to solve exercises regarding general and medical dosage techniques.

The practice question-sets offered to the students were carefully constructed over a long period of time, after extensively going through the necessary didactic material, with a special emphasis put on its clinical and practical aspects. These questions both follow the official programme of study, as well as being based on reliable and well-founded information.

In addition, sorting various groups of drugs in a table form, with respect to their key features, essentially directs the attention of the students to high-yield information they will most likely encounter in the medical field, thus offering a priceless advantage in the long run.

Exercises, in which the students are required to write out prescriptions, predominantly allow the students to acquire proper dosage techniques, as well as to develop essential clinical skills, so that when the time comes, they will be able to systematically analyse diverse clinical situations, and correspondingly select the optimal phamacologic therapy in that particular instant.

Therefore, taking into consideration all the aforementioned information, it is to be concluded that the teaching programme offered by the pharmacology department is proven to be advantageous in terms of proper lesson organization, so as to maximize the overall learning process, and of giving students the needed skills in order to select appropriate pharmacologic approaches and accurately apply their knowledge as needed.

GENERAL TIMELINE OF PRACTICAL LESSONS

1. Organizational moment and introduction	2 min
2. Answering questions	5 min
3. Determining the initial level of knowledge	15 min
4. Working independently	25 min
5. Experimental didactic film, virtual work and conclusions	20 min
6. Answering theoretical questions	45 min
7. Interactive work (clinical cases, simulations, tables)	20 min

NOTE! After each academic hour (45 min) break 10 min.

GENERAL PRESCRIPTION.
SOLID MEDICINAL FORMS.

A. Actuality. In most of the cases the treatment of sick people of any profile needs prescription of drugs. Therefore, we need to know the prescription forms, which are stated by our country, and the methods of prescription of diverse medicinal forms, used in medical practice.

B. The purpose of the training is to familiarize students with types of prescription formularies, with pharmacopoeia requirements towards drugs (purity, preservation and their posology) and with prescribing methods for solid medicinal forms.

C. Learning objectives:

a) The student **must know:**the structure of prescription, notion of drug new materials, medicinal substance and medicinal forms; masterly and officinal prescription, according to the drug nomenclature; chemical, commercial, common international (CIN) and officinal (pharmacopoeia) names of drugs; the abbreviations of Latin words and the signs used in prescriptions.

b) The student should **be able to**: correctly prescribe solid medicinal forms, to distinguish a correct prescription from the wrongone.

D. The initial level of knowledge required forinterdisciplinary integration:
Latin language.**Declaring nouns; prepositions used in the recipe; the main abbreviations and signs.**

E. Self-trainingquestions:

1. The medical prescription. Prescription and prescription formularies. General prescribing methods. Structure of the prescription. Words and auxiliary signs in the prescription (recipe). The main abbreviations. Preservation of prescriptionformularies.
2. State pharmacopoeia. International Pharmacopoeia. Their contentand importance.
3. The concept of "remedy", "drug", "active principle" (active substance, drug substance), "medicine" and "pro-drug". Components of the drug. Drug keeping.
4. Master, official, industrialdrugs. Medicines: inoffensive, highly active, toxic and narcotic. Natural, semisynthetic, synthetic drugs. Essentialdrugs. OTC medicines.
5. Drug Nomenclature. Chemical name, international common (ICN), official, commercial(firm).
6. Pharmacografia. Prescriptions of drugs. Posology (dosing of medicines). Dose and types of doses.
7. Raw materials used in drugs. Drugs and their classification (by consistency, the number of drugs contained and the mode of administration).
8. Solid medicinalforms.
9. Powders for internal use. Requirements for divided powders. Granules. Powders and granules in envelopes(packages).
10. Powders for external use, their destination.
11. Capsules.

12. Tablets. Variety oftablets.
13. Dragees.
14. Pills.
15. Films.
16. Briquettes.
17. Medicinal species.
18. Other solid medicinal forms:caramels,pencils.

F. Independent work (is done in written form while preparing for the lesson)

1) Medical prescriptionexercises

Prescribe recommended drugs in the following medicinal forms:

a) Powders for internaluse:

1 . 30 powders with rifampicin 150 mg. Internally, one powder three times a day.

2. 20 powders with 250 mg acetylsalicylic acid. Internally, 2 times aweek.
3. Powdersniclosamide 2 grams. Internally, for one administration.
4. 10 powders with 50 mg ascorbic acid and 20 mg rutoside. Internally, use powder 2 times aday.
5. 10 powders with nicotinic acid 50 mg. Internally, one powder three times aday.
6. 10 packages of granular powdermagurlite 2 grams. Internally, one packet to a cup of fruit juice 3 times a day.
7. Granules with Urodan 100 g. Internally, teaspoons of granules to a glass of water 3 times aday.

b) Powders for external use(powders):

1. "Galmanin" 50 g. Apply on damagedparts.
2. Sulfacetamide - 20 g. Apply on damagedparts.
3. Etacridine lactate 2,5% -10 g. For externaluse.

c) Capsules:

- Hard capsules:

1. 10 capsules with 2 mg loperamide. Internally, one capsule a day.
2. 20 capsules with 50 mg doxycycline hydrochloride. Internally, 2 capsules twice aday.
3. 20 capsules with 400 mg piracetam. Internally, take one capsule 3 times aday.

- for inhalations:

1. 10 capsules of 20 mg disodium cromoglycate. One capsule 4 times a day, for inhalations.

- elastic:

1. 15 capsules with 1 ml of castor oil. Internally, 5 capsules for one administration.
2. 10 capsules with 500 mg fern extract. Internally, 10 capsules for one administration.

d) Tablets:

1. 15 tablets with isoniazid 300 mg. Internally, one tablet a day.
2. 20 tablets with diphenhydramine 10 mg. Internally, one tablet twice aday.
3. 30 tablets with clonidine hydrochloride 75 mcg. Internally, one tablet three times aday.
4. **10 tablets "theofedrine". Internally, one tablet three times a day.**
5. **10 tablets "tempalgin". Internally, one tablet in headache.**

e) Dragees:

1. 10 dragees with chlorpromazine25 mg. Internally, three dragees aday.
2. 10 dragees with retinol acetate1 mg. Internally, three dragees aday.
3. 21 dragees "non-ovlion". Internally, one dragee a day.

f) Pills:

1. 30 pills with ferrous lactate500 mg. Internally, one pill three times a day.

g) Films:

1. 10 films with pilocarpine hydrochloride27 dmg. Three times aday,retropalpebral.
2. 10 films with "nonoxinol-9". To be administered intravaginally.

2) Tests (Guidelines for Laboratory Work in Pharmacology).

SOFT MEDICINAL FORMS.
MODIFIED RELEASE DOSAGE FORMS (PART 1).

A. Actuality. In most of the cases the treatment of sick people of any profile needs prescription of drugs. Therefore, we need to know the prescription forms, which are stated by our country, and the methods of prescription of diverse medicinal forms, used in medical practice.

B. The purpose of the training is to familiarize students with the methods of prescribing soft (semisolid) medicinalforms and with modified release dosage forms.

C. Learning objectives:

a) The student **must know:** the masterly and officinal prescription of semisolid medicinal forms; Latin abbreviations and signs used in prescription; modified release dosage forms.

b) The student **should be able to**: correctly prescribe semisolid (soft) medicinal forms, to distinguish a correct prescription from the wrongone.

D. The initial level of knowledge required forinterdisciplinary integration:

Latin language: Declaring nouns; prepositions used in the recipe; the main abbreviations and signs.

E. Self-trainingquestions:

1. Semisolid (soft) medicinal forms and theiruse.
2. Ointments. Excipients for ointments.Ophtalmicand nasal ointments, rarer varieties of ointments: creams, balms,gels.
3. Pastes.
4. Suppositories and their therapeuticuse.
5. Rods.
6. Liniments.
7. Patches.
8. Cataplasms.
9. Soaps.
10. Therapeutic (pharmaceutical) systems. Characteristics of pharmaceutical forms with modified release and transport systems of medicinal preparations:
    a) controlled drug delivery systems (monolith systems, reservoir systems, pumpsystems);
    b) drug delivery and delivery systems at target sites (vectorizedsystems, drugtransporters).

F. Independent work (is done in written form while preparing for the lesson)

3) Medical prescriptionexercises

Prescribe recommended drugs in the following medicinal forms:

a) Ointment:

- Oxolin - 0.25% - 10g. Apply to affected areas of theskin.
- Hydrocortisone -1% - 10g. For application on damaged areas of theskin.
- Ftorocort - 15 g. For application on damaged areas of theskin.

b) Paste:

- Zinc oxide - 25% - 30 g. Apply to affected areas of theskin.
- Dermatol -10% - 15 g. Apply to affected areas of theskin.
- Nitrofural - 0.2% - 50 g. For application on damaged areas of theskin.

c) Suppositories:

- 10 rectal suppositories with procaine100 mg. One suppository 3 timesaday.
- 10 suppositories “anusol”. Intrarectal use, one suppository twice a day.
- 10 vaginal suppositories with metronidazole500 mg. Onesuppositorytwice a day.

d) Patches:

- 10 tramadol 50 mg. Apply 1 patch on theforearm a day.
- 10 patches with lidocaine 100 mg. Apply 1 patch on theforearm a day.

4) Tests (Guidelines for Laboratory Work in Pharmacology).

MEDICINAL LIQUIDS AND GASES. MODIFIED DISTRIBUTION MEDICAMENTS (Part II)

A. Actuality. Treatment of the patient of any profile requires, in most cases, the use of medication. Hence the need to know the approved container forms and the prescribing methods of the various forms of medicine used in medical practice.

B. The purpose of the training. Familiarize students with methods of prescribing liquid and gaseous medicinal products and modified forms of medicated forms.

C. Learning objectives:

a) The student must **know**: the magistral and official prescription of the forms of liquid and gaseous drugs; Latin abbreviations and signs used in recipes; forms of modified distribution drugs.

b) The student should **be able to**: correctly prescribe the formulations of liquid and gaseous drugs, to distinguish the correct prescription from the wrong one.

D. Initial level of knowledge required for interdisciplinary integration

Latin language.Declaring nouns; prepositions used in the recipe; the main abbreviations and signs.

E. Self-training questions

1. Solutions for internal use. Classification.Requirements.Methods of dosing and calculation of their concentration.
2. Solutions for external use. Classification.Methods of expressing their concentration.Excipients for this type of solution.
3. Suspensions. Classification.Methods of prescribtion.The difference of solutions.
4. Drops for internal use. Requirements.Prescription methods.Calculation of their concentration.
5. Drops for external use. Classification.Vehicles for them.
6. Injections. Requirements for injectable forms.
7. Magistrainjectabilsolutions (prepared ex tempore). Prescription methods.Calculation of the dose for administration.
8. Injection into special packaging: ampoules, vials. Methods of prescription (solutions, suspensions, lyophilized powders).
9. Injection preparations with special names.
10. Aqueous extractive solutions (decoction, infusion), alcoholic (tinctures, extracts), oily (medicinal oils).
11. Typizating medications. Prescribing them.
12. Emulsions, syrups, aromatic waters, medicinal juices, mixtures, aerosols, organopreparations, pre-filled syringes (syringes).
13. Drugs with modified drug delivery and dispensing systems (Part II):
    a) What are the basic functions of targeted release delivery systems?
    b) Mechanisms and factors that determine the release of substances medicinal products from transport systems
    c) Characteristics of the carrier particles
    d) Therapeutic use of carrier particles
14. Drug gaseous forms. Aerosols.

F. Independent work (is done in written form while preparing for the lesson)

1.) Questions on medical prescription.

Write out the following drugs using and concentrations given below:

Prescribe recommended formulations in the following drug forms:

Solutions for internal use

1. Calcium chloride. Dose for single use - 75 centigrams. One spoonful 3 times a day.
2. Potassium acetate. Dose for single use - 1.5 grams. One spoonful 3 times a day.

Solutions for external use

- aqueous solutions

1. Psoralen 0.1% - 50 ml. Apply on injured parts of the skin.
2. Nitrofural 1: 5000 - 500 ml. To wash the wounds.

Suspensions for internal use

1. Magnesium oxide 20% - 150 ml. One spoonful 3 times a day. Shake before use.
2. Co-trimoxazole 100 ml. Internally, 2 teaspoons twice a day.

Drops for internal use

1. Potassium Iodide 0.00025. 5 drops 3 times a day.
2. Atropine sulphate, 0.0005. 10 drops 3 times a day.

Drops for external use

- aqueous solutions

1. Pilocarpine hydrochloride 1% - 10 ml. Eye drops. One drop seven times a day, in conjunctiva

- alcoholic solutions

1. Resorcinol 0.25% - 20 ml (in 25% ethyl alcohol). 100 ml.

Eye drops

- oily solutions

1. Chlofosfole 5% - 10 ml.

- glycerol solutions

1. Phenol 5% - 10 ml. Eye drops.

Magisterial injectable solutions

1. Sodium salicylate 15% - 50 ml. Intravenously, 10 ml each
2. Procaine 0.25% - 500 ml. For anesthesia by infiltration.
3. Glucose 5% - 500 ml. Intravenous in a slow infusion over 3 hours.

Official Injectable solutions

Ampoules

- aqueous injectable solutions

1. Calcium chloride 10% - 10 ml. Intravenously, 10 ml each.
2. Lidocaine 10% - 2 ml. Intramuscularly, 2 ml each.

- oily injection solutions

1. Hexestrol 0.1% -1 ml. Intramuscularly, 1 ml.

2. Hydroxyprogesteronecaproate 12.5% - 1 ml. Intramuscularly, 1 ml once a week.

- aqueous injectable suspensions

1. Deoxycorticosteronetrimethylacetate 2.5% - 1 ml. Intramuscularly, 1 ml once every 2 weeks.

- powdered powders

1. Stearic acid of 50 milligrams. Dissolve in 1 ml sterile injectable water. Intramuscularly 1 ml.
2. Prednisolone hemisuccinate of 25 milligrams. Dissolve in 5 ml water for injections. Intravenously.

Vials

- aqueous solutions

1. Insulin 40 UA / ml. 5 ml subcutaneously by 3 times a day.

- Suspensions

1. Cortisone acetate 2.5% - 10 ml. Intramuscularly. 1 ml a day.

- sterile solutions

1. Aminocaproic Acid 5% - 100 ml. Intravenous.
2. Mannitol 15% - 400 ml. Intravenous.

- lyophilized powders

1. Sodium Benzylpenicillin - 250000 UA. To be dissolved in 2 ml water for injections. Intramuscularly, 250000 UA 6 times a day.
2. Vincristine of 5 dmg. Dissolve in 1 ml of water for injections. Intravenously, 1 ml once a week.

Suspensions for external use

1. Dexamethasone 0.1% - 10 ml. In the conjunctival sac. One drop in each conjunctival sac 2 times a day.

Emulsions

1. Bismuth subnitrate 3 g in 250 ml of almond oil. One spoonful 3 times a day, 7 days.

Mixtures

1. Sodium benzoate 1 g, Bromhexine 1.5 g, 45 ml syrup - 250 ml volume. One spoonful 3 times a day for 5 days.

Syrups

1. Amoxicillin 28g - 200ml. One teaspoon of syrup every 6 hours for 7 days.

Decoctions

1. Oak bark decoction 20 g - 200 ml. For gargling.

Infusions

1. Chamomile flowers infusion 2 g / day for 4 days. One teaspoon 4 times a day, internally.

Tinctures

1. Valerian tincture 30 ml. Internal. 30 drops 3 times a day.

Fluid extracts

1. Shepherd’s purse 25 ml. Internal. 25 drops 3 times a day.

2) Tests (Guidance for Laboratory Work in Pharmacology)

GENERAL PHARMACOLOGY

1. General pharmacokinetics. Pharmacogenetics.
2. General pharmacodynamics.

A. Actuality. General pharmacology studies the fundamental laws of pharmacokinetics and pharmacodynamics of drugs, their interaction with the body. Their knowledge is necessary for the acquisition of special pharmacology in order to select a rational pharmacological therapy with minimal risk of adverse reactions as successful as possible. The laws of pharmacokinetics and pharmacodynamics underlie the experimental and clinical research of new drugs.

B. The purpose of the training. Acquiring basic pharmacokinetics (absorption, distribution, elimination) and pharmacodynamics (interactions with pharmacoreceptors, dosage principles, dependence on body specificities, drug interactions and side effects) to achieve qualitative and effective pharmacotherapy.

C. Learning objectives:

a) The student must **know**: General pharmacokinetics (pharmacokinetic parameters, general principles of drug absorption, transport, distribution and elimination), pharmacogenetics (enzymes, induction and suppression of enzymes) and pharmacodynamics (interaction with receptors, typical actions, dosages and principles of drug dosing, phenomena triggered by the associated and repeated administration of drugs).

b) The student should **be able to**: characterize pharmacokinetic parameters, drug delivery routes, absorption and transport mechanisms, metabolic and elimination pathways, types of action and typical drug action mechanisms, phenomena triggered by repeated and combined drug administration.

D. Initial level of knowledge required for interdisciplinary integration

General chemistry.Molecular ionization constant (pKa). Calculation of the proportion of the ionized form for different pH values using the Henderson-Hasselbach equation. Chemical reactions of oxidation, reduction, hydrolysis and conjugation. The notion of surfactants: ionogenic, non-ionic and amphoteric.

Bioorganic chemistry.Amino acids.Proteins.Chemical Mediators.Enzymes.

Molecular biology and human genetics. Cell membranes.Transmembrane transport.Genetic mutations.

Anatomy. The digestive device.Stomach and its functions.The small intestine and its functions. Liver and biotransformation processes. Kidneys and their basic functions.

Histology. Cell membranes and their structure.Subsequent substrate responsive substrate.Physico-chemical properties and molecular structure of the cytoplasmic membrane.Considerations about physiological barriers (haemato-encephalic etc.).

Physiology. Biomembranes. Electrolytic pumps. Cellular membrane transport. Blood flow. The gastrointestinal tract.Digestion and absorption.Liver function.Body fluids and kidneys.Receptors.Biological rhythms.

Biochemistry. Structural organization of biological membranes. Biochemistry of nutrition and digestion.The transport of substances in the body. Biochemistry of blood.Functional biochemistry of the liver and kidneys.Enzymes.Static membrane resting polarization.

Pathophysiology. Membrane processes and their disorders. Disruptions of synaptic transmission.Pathophysiology of the digestive system, blood, renal insufficiency and acid-base balance.

E. Self-training question:

1. Pharmacology, definition. Pharmacology as discipline.Its relationships with other disciplines.The Importance of Pharmacology for Practical Medicine.

2. The notion of medicine, pro-drug, remedy, placebo, drug. Allopathic and homeopathic medicines, original and generic, orphan, essential, OTC (non-prescription) medicines.Concept of active principle (drug substance).Their classification by origin and systemic principle.Sources of medication.Nomenclature of medicines.

3. The main steps of developing new drugs, assessing their efficacy and harmlessness.

4. Subdivisions of pharmacology (general and special). Basic and applied branches of pharmacology.

5. Pharmacokinetics. Pharmacokinetic parameters: bioavailability, plasma concentration, apparent volume of distribution (Vd), biological half-life (T ½), clearance (Cl), elimination rate constant (K.elim.). Their importance.

6. Classification of medication routes of administration. Particularities of the routes of administration through the digestive tract (sublingual, internal, rectal). Topical pathology features (cutaneous, ocular, auricular, electrophoresis) and intracavitary drug delivery. Particularities of parenteral routes of administration (subcutaneous, intramuscular, intravenous, etc.).The notion of transdermal therapeutic systems.Particularities of the administration routes in children.

7. Absorption of drugs. Absorption mechanisms.Factors influencing the absorption of drugs.The importance of pH and ionization constant (pKa) for absorption of drugs.Henderson-Hasselbach equation for the absorption of acidic and basic drugs.The influence of food on the absorption and effect of drugs.Interaction of drugs with food components. P-glycoprotein and other systems involved in drug absorption. Particularities of drug absorption in their associated administration.Particulars of drug absorption in children.

8. Drug penetration through biological membranes and barriers. Factors influencing membrane permeability for drugs.Characteristic of biological barriers.Particularities of drug penetration through the blood-brain and placental barrier.Cumulation of drugs in tissues.

9. Distribution of drugs in the body (transport, distribution and storage). The free and bound fraction of drugs in blood and tissues.Particularities of drug distribution in children.

10. Biotransformation (metabolism) of drugs in the body. The phases of biotransformation and their importance.The notion of presystemic metabolism (the effect of the first passage).The significance of the presystemic metabolism.Particularities of biotransformation in children.

11. Notion on the treatment and excretion of drugs. The main routes of excretion of drugs.Renal excretion, its particularities in neonates.The importance of urine pH for drug removal.Renal and hepatic clearance.Removal of drugs through the digestive tract, lungs, skin, milk. Kinetic models of order 0 and I.

12. Pharmacodynamics. Factors influencing the pharmacodynamics of the drug.Primary pharmacodynamic action of drugs.Overall pharmacological effect.The notion of receptors.Interaction of drugs with receptors.Receptor types and subtypes.Typical drug action mechanisms (mimetic, lytic and allosteric).Modifying the functional structure of macromolecules of DNA, RNA, membrane permeability and enzyme activity as typical drug action mechanisms. Drug Types of Action: Local (topical) and systemic (resorptive), direct and indirect (reflection), primary and secondary, selective and non-selective, reversible and irreversible medication.

13. Pharmacogenetics. Involvement of genetic factors in the effects of drugs.Genetic polymorphism (type of metaboliser).Enzymopathies.Induction and suppression of liver microsomal enzymes. Enzymatic Induction and Inhibit Drugs.

14. Notion of dose and its varieties. Therapeutic doses: minimum, mean and maximum for a single (single) dose and for 24 hours, the dose of the attack, the maintenance dose, the dose for a treatment cure. Toxic and fatal dose.Security Parameters (therapeutic index, safety margin, therapeutic range) and their importance.Graphical representation of the dose-effect relationship.Principles of Dosage of Medicines in Children and the Elderly.Biological standardization.Adverse reactions in overdosage.

15. The drugs and factors that influence their action: gender, age, body status, heredity, biorhythms. Drug action during pregnancy (embryotoxic, teratogenic, fetotoxic).

16. Notion of Chrono pharmacology. Chronopharmacokinetic. Chronopharmacodynamic. Principles of drug delivery based on biological rhythms.

17. Phenomena triggered by the drug: synergism (direct, indirect, infrared, summary and potentiated) and antagonism (direct, indirect, unilateral and bilateral, physiological, chemical, competitive). Indifference.

18. Repeated drug-induced phenomena: sensitization, tolerance, withdrawal syndrome, Rebound effect, functional impairment, drug addiction, tachyphylaxis, cumulation, and varieties.

F. Independent work (is done in written form while preparing for the lesson)
1.) Tests (Guidelines for Laboratory Work in Pharmacology).
2.) Clinical case (Guidelines for laboratory work in pharmacology).
3.) Virtual Situations (Guidelines for Laboratory Work in Pharmacology).
4.) Virtual didactic movie (during the seminar: protocol, conclusions)
5.) Tables

Table N1

Dependence of the rate of appearance of its effect and its duration on the route of administration of the drugs

Drug	Drug Form	Rout of administration	Onset (min)	Duration of effect (min/ hours)
	Sublingual tablets			
	Tablets for			

Nitroglycerin	internal use			
	Solution for injection			
	Plaster			
Tramadol	Capsule			
	Solution for Injection			
	Suppositories			

Table N2

Comparative feature of reactions of biotransformation of drugs

Parameters	Phase I reactions (metabolic transformations)	Phase II reactions (conjugation)
Types of chemical reactions		
Synthetic / non-synthetic reactions		
Enzymes involved in catalyzing these reactions		
Energy expenditure (High / low)		

Table N3

Some examples of receptors and their location

	Type	Coupled withG Protein	Coupled withenzyme	Coupled withan ion channel	Coupled withDNA
Receptors	Locating (on membrane or intracellular)				
	Examples of receptors				

Table N4

Choose for each term with digits *1* to *9* the appropriate sentences marked with the letters *a* to*i.*

Dose Range	Doses	Definition	Response
Therapy	1. Minimum	a) the death rate of 10% of the experimental animals	
	2. Average	b) the minimum quantity of the drug causing the pharmacological effect	
	3. Maximum	c) the dose causing the intoxication in 100% of the experimental animals	
Toxic	4. Minimum	d) the death rate of 100% of the experimental animals	
	5. Medium	e) The dose that causes the necessary therapeutic effect in the patient	
	6. Maximum	f) The maximum amount of drug that does not cause intoxication of the organism	
Lethal	7. Minimum	g) the dose causing intoxication in 10% of the experimental animals	
	8. Average	h) the dose causing intoxication to 50% of the experimental animals	

	9. Maximum	I) the dose causing the death to 50% of the experimental animals	

6.) Solve the case:

What amount of drug will be in the body over 1, 2, and 3 minutes, if known, that the drug was initially injected intravenously in 100 mg, and that the drug delivery rate constant is 0.1 mg / minute?

Concluding session
GENERAL PRESCRIPTION. GENERAL PHARMACOLOGY.

A. Actuality. In most of the cases the treatment of sick people of any profile needs prescription of drugs. Therefore, we need to know the prescription forms, which are stated by our country, and the methods of prescription of diverse medicinal forms, used in medical practice.

B. The purpose of the training is getting of students acquainted with prescription forms used in our country with Pharmacopoeia requirements to drugs (purity, storage and doxology of them).

C. Learning objectives:

a.) The sudents **must** know: the structure of prescription, notion of drug new materials, medicinal substance and medicinal forms; magistral and officinal prescription, according to the drug nomenclature; chemical, commercial, common international (CIN) and officinal (pharmacopoeia) names of drugs; Latin words and signs abbreviations used in prescriptions.

b.) The students must **be able to:** prescribe correctly solid and soft medicinal forms, differentiate a correct prescription from the wrong ones.

D. Initial level of knowledge required for interdisciplinary integration:

Latin language. Declaring nouns; prepositions used in the recipe; the main abbreviations and signs.

E. Self-training questions:

1. Classification of medicinal forms according to consistency.
2. Powders and varieties of there (for internal use, for external use).
3. Capsules.
4. Tablets, granules, pellets and pills.
5. Dragees, caramels, lighters, pencils and species.
6. Ointments and their varieties.
7. Suppositories and other semisolid medicinal forms.
8. Solutions and varieties (for internal use, for external use).
9. Suspensions and emulsions.
10. Injection and special packaging: ampoules and bottles (solutions, suspensions and lyophilized powders).
11. Extractive solutions (aqueous and oily). Derivatives of extractive solutions.
12. Liniments.
13. Drug gaseous forms. Aerosols.
14. Organic drugs.
15. The notion of transdermal therapeutic systems.16. Pharmaceutical forms with modified drug delivery and transport systems.
17. Types of drug transport systems and their fields of use.
18. Classification of pharmaceutical (drug) forms by route of administration.
19. The notion of phytotherapy and aromatherapy.
20. Pharmacology, definition. Pharmacology as a discipline. Its relationship with other disciplines. The Importance of pharmacology for practical medicine.
21. The notion of medicine, pro-drug, remedy, placebo, drug. Allopathic and homeopathic medicine, original and generic, orphan, essential, OTC (non-

prescription) drug. Concept of active principle (drug substance). Their classification by origin and systemic principle. Sources of obtaining medication. Nomenclature of medicines.

22. The main steps of elaboration of new drugs evaluation of their efficacy and inoffensivety.

23. Subdivisions of pharmacology (general and special). Basic and applicative branches of pharmacology.

24. Pharmacokinetics. Pharmacokinetic parameters: bioavailability, plasmatic concentration, apparent volume of distribution (Vd), biological half-life (T ½) , clearance (Cl), rate of elimination (K.elim.). Their importance.

25. Classification of ways of administration. Peculiarities of enteral ways of administration (sublingual, oral (internal), rectal). Particularities of topical ways of administration (cutaneous, ocular, auricular, electrophoresis) and intracavitary drug delivery. Particularities of parenteral routes of administration (subcutaneous, intramuscular, intravenous, etc.). The notion of transdermal therapeutic systems. . Peculiarities of ways of administration in children.

26. Absorption of drugs. Absorption mechanisms. Factors influencing the absorption of drugs. The importance of pH and ionization constant (pKa) for absorption of drugs. Henderson-Hasselbach equation for the absorption of acidic and basic drugs. The influence of food on the absorption and effect of drugs. Interaction of drugs with food components. P-glycoprotein and other systems involved in drug absorption. Particulars of drug absorption in their associated administration. Particulars of drug absorption in children.

27. Drug penetration through biological membranes and barriers. Factors influencing membrane permeability for drugs. Characteristic of biological barriers. Particularities of drug penetration through the blood-brain and placental barrier. Cumulation of drugs in tissues.

28. Distribution of drugs in the body (transport, distribution and storage). The free and bound fraction of drugs in blood and tissues. Particularities of drug distribution in children.

29. Biotransformation (metabolism) of drugs in the body. The phases of biotransformation and their importance. The notion of presystemic metabolism (the effect of the first passage). The significance of the presystemic metabolism. Particularities of biotransformation in children.

30. Notion about epuration and excretion of drugs. The main routes of excretion of drugs. Renal excretion, its particularities in newborn. The importance of urine pH for drugs excretion. Renal and liver clearance. Removal of drugs through the digestive tract, lungs, skin, milk. Pharmacokinetic models of the order "0" and "1".

31. Pharmacodynamics. Factors influencing the pharmacodynamics of the drug. Primary pharmacodynamic action of drugs. Global pharmacological effect. The notion of receptors. Interaction of drugs with receptors. Receptor types and subtypes. Typical drug action mechanisms (mimetic, lytic and allosteric). Modifying the functional structure of macromolecules of DNA, RNA, membrane permeability and enzyme activity as typical drug action mechanisms. Drug types of action: local (topical) and systemic (resorbtive), direct and indirect (reflection), primary and secondary, selective and non-selective, reversible and irreversible medication.

32. Pharmacogenetics. Involvement of genetic factors in the effects of drugs. Genetic polymorphism (type of metaboliser). Enzymopathy. Induction and suppression of liver microsomal enzymes. Enzymatic induction and inhibition of drugs.

33. The notion of pharmacography, posology. The notion about dose and its varieties. Therapeutic doses: minimum, mean and maximum for a single uses and for 24 hours, the dose of attack, the maintenance dose, the dose for a treatment cure. Toxic and lethal doses. Security parameters (therapeutic index, safety margin, therapeutic range) and their importance. Graphical representation of the dose-effect relationship. Principles of dosage of drugs in children and the elderly. Biological standardization. Side effects in overdosage.

34. The drugs and factors that influence their action: gender, age, state of the body, heredity, biorhythms. Drug action during pregnancy (embryotoxic, teratogenic

35.The notion of chrono-pharmacology.Cronopharmacokinetic. Cronopharmacodynamic. Principles of drug delivery based on biological rhythms.

36. Repeated drug-induced phenomena: synergism (direct, indirect, infrared, summary and potentiated) and antagonism (direct, indirect, unilateral and bilateral, physiological, chemical, competitive). Indifference.

37. Phenomena triggered by the drug: sensitization, tolerance, suspendation syndrome, Rebound effect, functional insufficiency, drug addiction, tachyphylaxis, cumulation and its variatis.

F. Independent work (is done in written form while preparing for the lesson)

Questions on medical prescriptions

Simple undivided powders

1. Urodan 70 g. Take one teaspoon a day 3 times a day. Dissolve beforehad in a glass of water.

Compound undivided powders

1. Calcium carbonate 100 g. Magnesium oxide 30 g. One teaspoon of 3 times a day.

Simple divided powders

1. 15 parasaminosalicylate powders of 1 g sodium. Oral administration of 1 powder three times a day for 4 days.

Compound divided powders

1. 20 rifampicine powders of 150 mg. Internally, one powder three times a day.
2. 10 routine powders of 1 mg with 50 mg of ascorbic acid. Internally take a powder 3 times a day for 5 days.

Granular powders

1. Orazi 100 g. Internally, a teaspoon of 3 times a day.

Powders

1.Chinosol 2% - 15 g. Externally. To press on the injured portion.

Capsules

1. Paniline of 20 dg, Nr. 10. Internally, one capsule twice a day.

Tablets

1. Metronidazole as 250 mg, Nr. 15. Oral administration of one tablet three a day.

2. "Nacom", N. 100. Orally 1 tablet twice daily.

Dragees

1.15 bromhexine in dragee of 4 mg each. Internally, a dragee of 3 times a day.

Pills

1.30 pills containing 1 milligram of arsenic anhydride at one outlet. One pill 2 times a day, 5 days.

Films

1.30 ophthalmic films containing 1 milligram of atropine sulphate. Retropalpebral, one film once a day, 5 days.

Caramel

1.50 caramels containing 15 centimiligram of decamene at one socket. Intrabucal, a caramel 6 times a day, 5 days.

Briquettes

1.6 "regulx" briquettes. One cigarette lighter 2 times a day, 3 days.

Species

1.Species collagogue. Internally. Prepare an infusion, a spoonful of water, twice a day, 10 days.

Ointments

1. Decamin 0.5% -30 g. Externally.
2. Viprosal 50 g. Add to the conjunctival sac every 3-4 hours.

Pastes

1.Clindamycin 2% - 25 g. Externally.

Gel

1. Diclofenac 1% - 25 g. Externally.

Cream

1. Terbinafine 1% - 15 g. Apply to the skin 2-3 times a day.

Suppositories

- rectal suppositories

1. 30 benzodine suppositories of 5 dg. Rectally a suppository twice a day.
2. 15 cefecon suppositories. Rectally a suppository twice a day for 6 days.

- vaginal suppositories

1. 5 clotrimazole suppositories of 1 cg. Intravaginal one suppository twice a day.

Rods (Bacilli)

1. 8 bujiuri with xeroform of 25 centimeters with a length of 2 cm and a thickness of 0.5 cm. In the cervix canal, once a day for 10 days.

Plasters

1. Plasters length 500 cm adhesive and width 3 cm. For fixing dressing .

Solutions for internal use

1. Sodium thiosulphate in a dose for a 3 g dose. One spoonful 3 times a day. For 4 days.
2. Potassium acetate dose to 1 g. One spoon 3 times a day. For 4 days.

Solutions for external use

1. Resorcinol 2% - 100 ml. For compresses.

- alcoholic

1. Chlorophyllite 1% - 200 ml. Externally.

- oily

1. Vinyl 20% - 100 ml. For dressing.

Drops for internal use

- aqueous

1. Tilidine 5% - 10 ml. Internally. 10 drops twice a day.

- alcoholic

1. Menthol 15% - 10 ml. Internal. 5 drops per 1/4 glass of water 3 times a day.

Drops for external use

- aqueous

1. Sulfathiazole 10% -10 ml. Eyewash.

- oily

1.Benzocaine 10% - 10 ml; Top applies to mu anesthesia hoes.

- glycerol

1. Phenol 5% - 5 ml. Eye drops.

- alcoholic

1. Salicylic acid 2% - 5 ml. Eye drops.

Emulsions

1.Almond oil 20 ml. Internal. One teaspoon of 3 times a day.

2.Pumpkin seeds 15 g. Intern. One teaspoon of 3 times a day.

Injection solutions

1. Sodium iodide 10% - 50 ml. For truncated anesthesia.

2. 100 ml solution sterile 5% albumin . For infusions slow intravenous infusion .

3.200 ml procaine sterile solution 0,5% prepared on the base of the 0.9% solution of chloride sodium . To use the solution for anesthesia through infiltration.

Injectable drug forms in special packaging

- ampoules

1. Sodium oxybutyrate 20% - 1 ml (10 ampoules). 1 ml intravenously.

2. Silabolin oily solution 2.5% - 1 ml (20 ampoules). 1 ml intramuscularly.

3. Photritamin 10 mg (10 ampoules). To dilute before in one ml of water for injections and to be administered intramuscularly.

vials (phials, bottles)

1. Gentamicin 8 cg (10 vials). Take 2.5 ml 3 times a day intramuscularly.

2. Benzynylpenicillin 1200000 (10 vials). Dilute the contents of the vial into water for injections and administer 500,000 IU intramuscularly 6 times a day.

3. Albumin 5% - 100 ml (5 vials). Intravenous infusion of 40 drops per minute.

Aqueous extractive solutions

- infusions

1. Corn silk in the dose for a socket equal to 0.75 g. How smooth mouth 3 times a day.

- decoctures

1. Cranberry Fruit 1.0, 180 ml. For gargle.

Extractive alcoholic solutions

- tinctures

1. Goosefoot. Internal. 30 drops 3 times a day.

- Fluid extracts

1. Pepper, 25 ml. Internal. 25 drops 3 times a day.

Liniments

1. Aloe Linen 100 ml.

2. Sintomycin 1% - 25 ml. Apply to affected areas of the skin.

Aerosols

- Dose

1. Berodual 1 vial (15 ml). For inhalation, one puff needed in bronchial asthma, without exceeding 3 doses a day.

- Without dose

1. Livian 1 bottle. For spraying infected wounds.

Recapitulation of knowledges

1.Select a dose equal to 3 mg: a) 3,0 b) 0,3 c) 0,03 d) 0,003 e) 0,0003.

2.Select a dose equal to 15 centigrams: a) 0,15 b) 0,015 c) 0,0015 d) 0,00015 e) 0,000015.

3.Select the dose equal to 15 decimiligrams: a) 0,15 b) 0,015 c) 0,0015 d) 0,00015 e) 0,000015.

4.Calculate the amount of active substance in a tablespoon with 10% calcium chloride solution: a) 1,5 b) 0,15 c) 0,015 d) 0,1 e) 1,0.

5.Calculate the amount of active substance in 2 tablespoons with 3% sodium bromide solution: a) 2,0 b) 0,45 c) 0,9 d) 0,03 e) 0,3.

6.What quantity of active substance is contained in 1 ml of 0,05% neostigmine solution?: a) 5,0 b) 0,5 c) 0,05 d) 0,005 e) 0,0005.

7.What amount of active substance is contained in 10 drops of 1% pilocarpine solution: a) 0,005 b) 0,0005 c) 0,05 d) 0,01 e) 0,0001.

8. One patient was prescribed internally 30 drops of 0.1% solution of atropine sulfate. The maximum dose for one dose (DMP) is 1mg. Calculate: a) DMP is increased b) DMP is not increased.

9.One patient was indicated subcutaneously 1 ml of 5% ephedrine solution. The maximum dose for one socket (DMP) is 5 centigrams. Calculate: a) DMP is increased b) DMP is not increased.

10.One patient was given 180 ml of potassium iodide solution 1 tablespoon of 3 times a day. Indicate the concentration of the solution so that the patient at one prize receives 0.45 of potassium iodide: a) 3% b) 0,3% c) 0,03% d) 0,003% e) 0,0003%.

3.) Tests (Guidelines for Laboratory Work in Pharmacology).

4.) Clinical case (Guidelines for Laboratory Work in Pharmacology).

5.) Virtual situations (Guidelines for Laboratory Work in Pharmacology).

6.) Virtual didactic movie.