Assessment Toolkit for the discipline

"CLINICAL PHARMACOLOGY"

Higher Education Level

SPECIALIST DEGREE PROGRAM

Field of Study **560001 General Medicine (For international students)**

(code and name of the field of study)

Qualification: **Physician (General Medicine)**

Bishkek-2026

The set of assessment tools is designed to monitor students' knowledge in the field of study (specialty) "General Medicine" within the discipline of "Clinical Pharmacology."

The set of assessment tools has been reviewed and approved at a meeting of the Department of Basic and Clinical Pharmacology, Chemistry, and Biochemistry.

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1. General Provisions

The Fund of Assessment Tools is designed to evaluate students' knowledge, skills and practical competencies acquired during the study of Clinical Pharmacology.

The main objectives are to assess students' ability to:

- Apply pharmacokinetic and pharmacodynamic principles in clinical practice.
- Select medicines based on evidence-based medicine and clinical guidelines.
- Develop individualized pharmacotherapy regimens.
- Calculate and adjust drug doses.
- Identify clinically significant drug interactions.
- Recognize and assess adverse drug reactions.
- Interpret therapeutic drug monitoring results.
- Evaluate the efficacy and safety of pharmacotherapy.
- Apply principles of rational prescribing, pharmacovigilance and deprescribing.

2. Expected Learning Outcomes

2.1. Knowledge – Students should know:

1. Principles and objectives of clinical pharmacology.
2. Clinical significance of pharmacokinetics and pharmacodynamics.
3. Mechanisms of action and clinical applications of major pharmacological groups.
4. Principles of evidence-based pharmacotherapy.
5. Factors influencing individual drug response.
6. Pharmacokinetic changes in renal and hepatic impairment.
7. Mechanisms and clinical significance of drug interactions.
8. Classification and prevention of adverse drug reactions.
9. Principles of therapeutic drug monitoring.
10. Principles of rational prescribing and individualized pharmacotherapy.
11. Pharmacotherapy in children, older adults and pregnant women.
12. Principles of antimicrobial stewardship and pharmacovigilance.
13. Polypharmacy, medication review and deprescribing.

2.2. Skills – Students should be able to:

1. Select medicines according to clinical indications and current guidelines.
2. Justify the choice of medicines based on efficacy, safety and cost-effectiveness.
3. Calculate individual doses and dosing intervals.
4. Adjust doses according to renal and hepatic function.
5. Identify contraindications and clinically significant drug interactions.
6. Recognize and assess adverse drug reactions.
7. Interpret relevant laboratory and clinical parameters.
8. Apply therapeutic drug monitoring principles.
9. Evaluate the efficacy and safety of pharmacotherapy.
10. Identify inappropriate polypharmacy and medication-related problems.
11. Use reliable clinical pharmacology databases and scientific literature.

2.3. Practical Competencies – Students should be proficient in:

1. Conducting clinical pharmacological assessment of medication regimens.
2. Developing individualized pharmacotherapy plans.
3. Calculating and adjusting drug doses.
4. Evaluating the benefit-risk profile of medicines.
5. Identifying and preventing adverse drug reactions and interactions.
6. Interpreting therapeutic drug monitoring results.
7. Conducting medication reviews.
8. Applying antimicrobial stewardship principles.
9. Justifying pharmacotherapeutic decisions using evidence-based medicine.

3. Structure of Assessment Tools

Assessment tool	Number	Assessment stage
Review questions	100	Ongoing
Multiple-choice questions	50	Ongoing/interim
Situational clinical-pharmacological tasks	20	Ongoing/interim
Dose calculation tasks	20	Ongoing
Drug interaction analysis tasks	10	Ongoing
Medication review tasks	10	Ongoing
Practical pharmacotherapy assignments	20	Ongoing/interim
Examination questions	40	Interim
Examination tickets	20	Interim

The following sections provide the assessment materials and sample tasks.

4. Multiple-Choice Questions (MCQs)

Choose one correct answer.

Section I. Clinical Pharmacokinetics and Pharmacodynamics

1. Which pharmacokinetic parameter describes the volume of plasma cleared of a drug per unit of time?

A. Bioavailability
B. Clearance
C. Half-life
D. Volume of distribution

2. Which parameter determines the time required to reach steady state during repeated administration of a drug with linear pharmacokinetics?

A. Absorption rate
B. Elimination half-life
C. Peak concentration
D. Bioavailability

3. What is the main purpose of a loading dose?

A. To prevent drug interactions
B. To achieve the target plasma concentration rapidly
C. To reduce drug metabolism
D. To increase renal excretion

4. Which organ is primarily responsible for the metabolism of most medicines?

A. Heart
B. Liver
C. Spleen
D. Pancreas

5. What does a narrow therapeutic index indicate?

A. A wide margin between effective and toxic doses
B. A small margin between effective and toxic concentrations
C. Absence of adverse reactions
D. Complete predictability of drug response

6. Which enzyme system is important in the metabolism of many medicines?

A. Cytochrome P450
B. Acetylcholinesterase
C. Cyclooxygenase
D. Carbonic anhydrase

7. What is pharmacogenetics primarily concerned with?

A. Drug prices
B. Genetic variations affecting drug response
C. Drug packaging
D. Pharmaceutical manufacturing

8. Which statement best describes a competitive receptor antagonist?

A. It activates the receptor irreversibly
B. It competes with an agonist for receptor binding
C. It increases receptor synthesis
D. It permanently increases receptor sensitivity

Section II. Cardiovascular Pharmacotherapy

9. Which adverse effect is characteristic of ACE inhibitors?

A. Dry cough
B. Ototoxicity
C. Hypoglycemia
D. Gingival hyperplasia

10. Which electrolyte abnormality may occur with spironolactone?

A. Hypokalemia
B. Hyperkalemia
C. Hypercalcemia
D. Hypernatremia

11. Which laboratory parameter is routinely used to monitor warfarin therapy?

A. INR
B. Serum glucose
C. Serum sodium
D. Hemoglobin A1c

12. Which drug is a direct factor Xa inhibitor?

A. Warfarin
B. Apixaban
C. Aspirin
D. Clopidogrel

13. Which drug class is commonly used to reduce LDL cholesterol?

A. Statins
B. Antihistamines
C. Antacids
D. Beta-2 agonists

14. Which parameter should be monitored in patients receiving loop diuretics?

A. Electrolytes and renal function
B. Visual acuity only
C. Serum amylase only
D. Thyroid antibodies only

15. Which drug reverses the anticoagulant effect of unfractionated heparin?

A. Vitamin K
B. Protamine sulfate
C. Naloxone
D. Flumazenil

Section III. Endocrine and Respiratory Pharmacotherapy

16. Which medicine is associated with an increased risk of hypoglycemia?

A. Insulin
B. Amlodipine
C. Omeprazole
D. Loratadine

17. Which class of medicines improves glycemic control by increasing urinary glucose excretion?

A. SGLT2 inhibitors
B. ACE inhibitors
C. Beta-blockers
D. Proton pump inhibitors

18. Which adverse effect may occur with prolonged systemic glucocorticoid therapy?

A. Osteoporosis
B. Hypoglycemia in all patients
C. Severe bradycardia in all patients
D. Ototoxicity

19. Which medicine is a short-acting beta-2 agonist?

A. Salbutamol
B. Budesonide
C. Montelukast
D. Tiotropium

20. Which medicine belongs to the proton pump inhibitor group?

A. Famotidine
B. Omeprazole
C. Metoclopramide
D. Sucralfate

Section IV. Antimicrobial Pharmacotherapy

21. Which antibiotic class inhibits bacterial cell wall synthesis?

A. Beta-lactams
B. Macrolides
C. Tetracyclines
D. Aminoglycosides

22. Which antibiotic class acts on the 50S ribosomal subunit?

A. Macrolides
B. Fluoroquinolones
C. Beta-lactams
D. Glycopeptides

23. Which adverse reactions are particularly associated with aminoglycosides?

A. Nephrotoxicity and ototoxicity
B. Hypoglycemia and hypercalcemia
C. Gingival hyperplasia and constipation
D. Dry cough and angioedema

24. What is the main principle of antimicrobial stewardship?

A. Routine use of broad-spectrum antibiotics
B. Appropriate antimicrobial selection and duration
C. Antibiotic treatment of all viral infections
D. Avoidance of microbiological investigations in all cases

25. Which factor is particularly important when adjusting aminoglycoside doses?

A. Renal function
B. Hair color
C. Blood group
D. Visual acuity

26. Which medicine is an antifungal agent?

A. Fluconazole
B. Amoxicillin
C. Acyclovir
D. Oseltamivir

27. Which mechanism contributes to bacterial resistance to beta-lactam antibiotics?

A. Beta-lactamase production
B. Increased insulin secretion
C. Inhibition of human DNA synthesis
D. Increased gastric acid production

Section V. Adverse Reactions and Drug Interactions

28. Which combination may increase the risk of bleeding?

A. Warfarin and ibuprofen
B. Paracetamol and saline
C. Amoxicillin and loratadine
D. Metformin and calcium carbonate

29. Which combination may increase the risk of hyperkalemia?

A. Enalapril and spironolactone
B. Amlodipine and omeprazole
C. Salbutamol and loratadine
D. Paracetamol and amoxicillin

30. Which adverse reaction is associated with ACE inhibitor use?

A. Angioedema
B. Ototoxicity
C. Retinal detachment
D. Severe hypocalcemia

31. What is the main purpose of pharmacovigilance?

A. Monitoring and prevention of adverse drug reactions
B. Determining medicine prices
C. Advertising pharmaceutical products
D. Replacing clinical trials

32. Which parameter is important when evaluating possible drug-induced liver injury?

A. ALT and AST
B. Serum sodium only
C. Platelet count only
D. Blood group

33. Which medicine may increase the risk of QT interval prolongation?

A. Selected macrolide antibiotics
B. Oral rehydration solution
C. Normal saline
D. Topical emollients

Section VI. Special Populations and Individualized Pharmacotherapy

34. Why may drug doses need adjustment in chronic kidney disease?

A. Reduced renal clearance may cause drug accumulation
B. Renal impairment always increases drug absorption
C. All medicines are metabolized exclusively by the kidneys
D. Kidney disease eliminates drug interactions

35. Which factor is particularly important when prescribing medicines to children?

A. Body weight and age
B. Hair color
C. Blood group only
D. Height alone

36. What is polypharmacy?

A. Use of multiple medicines by one patient
B. Use of one medicine in several dosage forms
C. Use of medicines only in hospitals
D. Administration of medicines by injection

37. What is deprescribing?

A. Systematic reduction or discontinuation of medicines when clinically appropriate
B. Increasing all doses simultaneously
C. Replacing generic medicines with branded medicines
D. Prescribing additional medicines without review

38. What should be considered before prescribing a medicine during pregnancy?

A. Benefit-risk assessment for the mother and fetus
B. The medicine's color
C. The manufacturer's advertising
D. The medicine's packaging size only

Section VII. Therapeutic Drug Monitoring and Rational Prescribing

39. Which medicine commonly requires therapeutic drug monitoring after transplantation?

A. Tacrolimus
B. Paracetamol
C. Loratadine
D. Amoxicillin

40. What should be considered when interpreting a tacrolimus concentration?

A. Sampling time and concomitant medicines
B. Hair color and height only
C. Blood group only
D. The tablet packaging color

41. What is medication adherence?

A. The extent to which a patient follows an agreed treatment regimen
B. The number of medicines available in a pharmacy
C. The cost of a prescription
D. The number of laboratory tests performed

42. What is the primary purpose of medication reconciliation?

A. Comparing medication information across transitions of care
B. Increasing the number of prescribed medicines
C. Replacing all medicines with generics
D. Avoiding patient interviews

43. Which source is most appropriate for checking official prescribing information?

A. Approved product information
B. Unverified social media posts
C. Commercial advertisements
D. Anonymous online comments

44. What should be assessed when a medicine appears ineffective?

A. Diagnosis, adherence, dose, interactions and treatment duration
B. Packaging color only
C. Manufacturer's advertising budget
D. Tablet shape only

45. What is the purpose of a clinical medication review?

A. To identify and resolve medication-related problems
B. To increase the number of medicines
C. To replace all laboratory tests
D. To eliminate all long-term therapy

46. Which factor may reduce medication adherence?

A. Complex dosing regimens
B. Clear patient instructions
C. Appropriate follow-up
D. Shared decision-making

47. What is the main aim of individualized pharmacotherapy?

A. Tailoring treatment to patient-specific characteristics
B. Prescribing identical doses to all patients
C. Avoiding all laboratory monitoring
D. Using only the newest medicines

48. Which measure is important when assessing the safety of anticoagulant treatment?

A. Evaluation of bleeding risk
B. Routine assessment of hair growth
C. Measurement of visual acuity only
D. Assessment of body temperature only

49. What should be considered when using medicines with a narrow therapeutic index?

A. Close monitoring and careful dose individualization
B. Unrestricted dose escalation
C. No need for follow-up
D. Identical dosing in all patients

50. What is the main objective of rational pharmacotherapy?

A. Achieving the best possible therapeutic outcome with acceptable risk
B. Prescribing the largest number of medicines
C. Always selecting the most expensive medicine
D. Avoiding treatment monitoring

Answer Key

Questions	**Correct answers**
1–10	B, B, B, B, B, A, B, B, A, B
11–20	A, B, A, A, B, A, A, A, A, B
21–30	A, A, A, B, A, A, A, A, A, A
31–40	A, A, A, A, A, A, A, A, A, A
41–50	A, A, A, A, A, A, A, A, A, A

5. Situational Clinical-Pharmacological Tasks

Case 1. Drug-Induced Hyperkalemia

A 68-year-old patient with hypertension and chronic kidney disease receives enalapril and spironolactone. Laboratory tests reveal increased serum potassium.

Questions:

1. Explain the mechanisms of action of both medicines.
2. Identify the potential drug interaction.
3. Explain the risk of hyperkalemia.
4. Which clinical and laboratory parameters should be monitored?
5. What pharmacotherapeutic decisions should be considered?

Expected answer: Both medicines inhibit components of the renin-angiotensin-aldosterone system and may increase potassium concentrations. Renal function, potassium levels, clinical condition and indications for both medicines require reassessment. Treatment modification should be individualized.

Case 2. Increased INR During Antibiotic Treatment

A patient receiving warfarin for atrial fibrillation starts antibiotic treatment. Several days later, INR increases significantly.

Questions:

1. Identify possible mechanisms of the interaction.
2. What are the potential consequences?
3. Which clinical parameters should be assessed?
4. What monitoring and management measures are appropriate?

Expected answer: Some antibiotics may alter warfarin metabolism, vitamin K availability or intestinal flora. The patient may develop an increased bleeding risk. INR and clinical signs of bleeding should be assessed promptly.

Case 3. Hypoglycemia During Insulin Treatment

A patient with type 2 diabetes develops sweating, tremor, palpitations and confusion after receiving insulin.

Questions:

1. Identify the suspected adverse drug reaction.
2. Explain its pharmacological mechanism.
3. Identify potential contributing factors.
4. Describe the principles of immediate management and prevention.

Expected answer: Suspected insulin-induced hypoglycemia. Blood glucose should be checked promptly where feasible, and treatment should follow the patient's clinical condition and established hypoglycemia protocols.

Case 4. Aminoglycoside-Associated Nephrotoxicity

A patient receiving gentamicin develops an increase in serum creatinine.

Questions:

1. Explain the mechanism of nephrotoxicity.
2. What pharmacokinetic parameters influence gentamicin dosing?
3. Which monitoring procedures are required?
4. What is the role of therapeutic drug monitoring?

Expected answer: Gentamicin may accumulate in renal tubular cells and cause nephrotoxicity. Renal function, dosing interval, treatment duration and drug concentrations should be considered.

Case 5. Polypharmacy in an Older Adult

A 78-year-old patient takes eight medicines for cardiovascular disease, diabetes and osteoarthritis. The patient reports dizziness and weakness.

Questions:

1. Define polypharmacy.
2. Identify possible medication-related problems.
3. Explain the role of drug interactions.
4. Describe the medication review process.
5. What is deprescribing?

Expected answer: A structured medication review should assess indications, doses, interactions, adverse effects, adherence and treatment burden. Deprescribing may be considered when a medicine's potential harms exceed its expected benefits.

Case 6. Tacrolimus Monitoring

A patient after kidney transplantation receives tacrolimus. The trough concentration is above the intended therapeutic range.

Questions:

1. Explain the mechanism of action of tacrolimus.
2. Why is therapeutic drug monitoring important?
3. Which medicines may alter tacrolimus concentrations?
4. What factors should be considered before changing the dose?

Expected answer: Tacrolimus inhibits calcineurin and suppresses T-cell activation. Its concentration may be influenced by CYP3A4/CYP3A5 interactions, adherence, sampling time, hepatic function and other patient factors. Dose changes require specialist assessment.

Case 7. ACE Inhibitor-Associated Cough

A patient receiving enalapril develops a persistent dry cough.

Questions:

1. Explain the mechanism of this adverse reaction.
2. Identify the pharmacological group.
3. What alternative treatment class may be considered?
4. What clinical factors should be evaluated?

Expected answer: ACE inhibition reduces bradykinin degradation. An angiotensin receptor blocker may be considered if clinically appropriate.

Case 8. Antimicrobial Stewardship

A patient with an uncomplicated viral respiratory infection requests antibiotics.

Questions:

1. Explain why antibiotics are not indicated for uncomplicated viral infections.
2. Describe the risks of unnecessary antibiotic use.
3. Explain antimicrobial resistance.
4. Identify the principles of responsible antibiotic prescribing.

Expected answer: Antibiotics act against susceptible bacteria and do not treat viral infections. Unnecessary use contributes to resistance and adverse reactions.

Case 9. Drug-Induced Liver Injury

A patient receiving multiple medicines develops increased ALT and AST.

Questions:

1. Define drug-induced liver injury.
2. Identify possible pharmacological causes.
3. What additional laboratory parameters are relevant?
4. How should the medication regimen be assessed?

Expected answer: Assess the timing of drug exposure, liver biochemical profile, bilirubin, clinical symptoms, alternative causes and potentially hepatotoxic medicines. Suspected serious injury requires prompt clinical evaluation.

Case 10. Treatment Failure

A patient with hypertension remains above the target blood pressure despite receiving several medicines.

Questions:

1. Identify possible causes of apparent treatment failure.
2. Explain the importance of medication adherence.
3. What interactions or secondary causes should be considered?
4. Which monitoring and reassessment measures are appropriate?

Expected answer: Consider adherence, measurement accuracy, dose adequacy, treatment duration, drug interactions, lifestyle factors and secondary hypertension before modifying therapy.

6. Dose Calculation Tasks

All numerical examples are educational and are not universal prescribing recommendations.

1. Calculate a dose of 5 mg/kg for a patient weighing 60 kg.
2. A solution contains 25 mg/mL. Calculate the volume required for a 100 mg dose.
3. Calculate the daily dose if 250 mg is administered three times daily.
4. A patient receives 500 mg every 12 hours. Calculate the total daily dose.
5. A solution contains 2 g in 100 mL. Calculate its concentration in mg/mL.
6. Calculate the loading dose for a target concentration of 5 mg/L, volume of distribution of 40 L and bioavailability of 100%.
7. Calculate the maintenance dose rate when clearance is 4 L/hour and the target concentration is 2 mg/L.
8. A medicine has a half-life of 8 hours. Calculate the approximate percentage remaining after 24 hours, assuming first-order elimination.
9. Calculate an infusion rate of 500 mL over 4 hours in mL/hour.
10. Calculate the oral dose required to provide systemic exposure equivalent to 100 mg intravenously when oral bioavailability is 50%, assuming linear pharmacokinetics.

7. Drug Interaction Analysis Tasks

For each combination, identify the possible interaction mechanism, clinical risk and appropriate monitoring.

No.	Drug combination	Main safety issue
1	Warfarin + ibuprofen	Increased bleeding risk
2	Enalapril + spironolactone	Hyperkalemia
3	Gentamicin + furosemide	Increased ototoxicity risk
4	Clarithromycin + simvastatin	Increased statin exposure and myopathy risk
5	Metformin + iodinated contrast media	Risk of complications if acute kidney injury develops
6	Opioids + benzodiazepines	Sedation and respiratory depression
7	Tacrolimus + clarithromycin	Increased tacrolimus exposure
8	NSAIDs + ACE inhibitors + diuretics	Increased acute kidney injury risk
9	Multiple QT-prolonging medicines	Increased risk of arrhythmia
10	Insulin + sulfonylurea	Increased hypoglycemia risk

8. Medication Review Tasks

Students should analyze hypothetical medication regimens and identify:

1. Medicines without a documented indication.
2. Potentially inappropriate medicines.
3. Duplicate pharmacological therapy.
4. Clinically significant drug interactions.
5. Doses requiring adjustment.
6. Medicines associated with increased fall risk.
7. Medicines that may cause renal or hepatic injury.

8. Potential adherence problems.
9. Opportunities for deprescribing.
10. Required clinical and laboratory monitoring.

Expected output: A structured medication review report containing identified problems, pharmacological justification, proposed actions and a follow-up monitoring plan.

9. Practical Assessment Tasks

Students should demonstrate the ability to:

1. Prepare a clinical pharmacological profile of a medicine.
2. Compare medicines from the same pharmacological group.
3. Select an appropriate medicine using clinical guidelines.
4. Justify a pharmacotherapy regimen.
5. Calculate an individualized dose.
6. Adjust a dosing regimen according to renal function.
7. Identify contraindications and interactions.
8. Interpret an adverse drug reaction.
9. Interpret therapeutic drug monitoring results.
10. Evaluate a medication list.
11. Identify polypharmacy-related risks.
12. Develop a medication monitoring plan.
13. Assess treatment adherence.
14. Apply antimicrobial stewardship principles.
15. Analyze potential drug-induced liver injury.
16. Assess possible drug-induced nephrotoxicity.
17. Evaluate treatment failure.
18. Use official prescribing information.
19. Prepare an educational medication order.
20. Explain medication safety recommendations to a patient.

10. Examination Questions for Interim Assessment

1. Definition, objectives and scope of clinical pharmacology.
2. Principles of evidence-based pharmacotherapy.
3. Clinical significance of pharmacokinetics.
4. Pharmacokinetic parameters and their clinical application.
5. Loading and maintenance doses.
6. Pharmacokinetic changes in renal impairment.
7. Pharmacokinetic changes in hepatic impairment.
8. Therapeutic drug monitoring.
9. Clinical pharmacodynamics.
10. Pharmacogenetics and individualized pharmacotherapy.
11. Classification and prevention of adverse drug reactions.
12. Pharmacokinetic drug interactions.
13. Pharmacodynamic drug interactions.
14. Principles of pharmacovigilance.
15. Clinical pharmacology of ACE inhibitors.
16. Clinical pharmacology of beta-blockers.
17. Pharmacotherapy of chronic heart failure.

18. Clinical pharmacology of anticoagulants.
19. Monitoring anticoagulant treatment.
20. Clinical pharmacology of lipid-lowering medicines.
21. Pharmacotherapy of bronchial asthma.
22. Clinical pharmacology of proton pump inhibitors.
23. Pharmacotherapy of type 2 diabetes mellitus.
24. Clinical pharmacology of insulin.
25. Clinical pharmacology of glucocorticoids.
26. Rational antimicrobial therapy.
27. Clinical pharmacology of beta-lactam antibiotics.
28. Clinical pharmacology of aminoglycosides.
29. Antimicrobial resistance and stewardship.
30. Dose adjustment in renal impairment.
31. Pharmacotherapy in older adults.
32. Pharmacotherapy during pregnancy.
33. Pharmacotherapy in children.
34. Polypharmacy and its clinical consequences.
35. Medication review and deprescribing.
36. Drug-induced liver injury.
37. Drug-induced nephrotoxicity.
38. Clinical interpretation of therapeutic drug monitoring.
39. Medication adherence and treatment outcomes.
40. Principles of rational and safe prescribing.

11. Sample Examination Tickets

Examination Ticket No. 1

1. Clinical pharmacology: objectives and principles.
2. Clinical pharmacokinetics and its application.
3. Practical task: calculate a loading dose.

Examination Ticket No. 2

1. Clinical pharmacodynamics.
2. Adverse drug reactions and pharmacovigilance.
3. Situational task: assess a suspected adverse drug reaction.

Examination Ticket No. 3

1. Clinical pharmacology of ACE inhibitors and ARBs.
2. Drug interactions involving anticoagulants.
3. Situational task: evaluate an increased INR in a patient receiving warfarin.

Examination Ticket No. 4

1. Therapeutic drug monitoring.
2. Clinical pharmacology of aminoglycosides.
3. Situational task: evaluate possible gentamicin-associated nephrotoxicity.

Examination Ticket No. 5

1. Rational antimicrobial therapy.
2. Clinical pharmacology of insulin and glucose-lowering medicines.
3. Practical task: identify and assess hypoglycemia risk.

Examination Ticket No. 6

1. Individualized pharmacotherapy in older adults.
2. Polypharmacy and deprescribing.
3. Practical task: perform a medication review.

Examination Ticket No. 7

1. Clinical pharmacology of medicines used in chronic heart failure.
2. Pharmacokinetic changes in renal impairment.
3. Practical task: identify parameters required for dose adjustment.

Examination Ticket No. 8

1. Pharmacogenetics and personalized medicine.
2. Clinical pharmacology of immunosuppressants.
3. Situational task: assess an elevated tacrolimus concentration.

Examination Ticket No. 9

1. Clinical pharmacology of lipid-lowering medicines.
2. Drug-induced liver injury.
3. Practical task: develop a medication safety monitoring plan.

Examination Ticket No. 10

1. Clinical pharmacology of anticoagulants.
2. Drug interactions and bleeding risk.
3. Situational task: evaluate a patient receiving warfarin and an NSAID.

12. Assessment Criteria

12.1. Theoretical knowledge

Score	Grade	Assessment criteria
90–100	Excellent	Comprehensive knowledge; correct pharmacological reasoning; evidence-based justification
75–89	Good	Good knowledge; minor errors that do not affect the main conclusions
60–74	Satisfactory	Basic knowledge; partial understanding; requires guidance in complex cases
Below 60	Unsatisfactory	Insufficient knowledge; significant errors in pharmacotherapy and medication safety

12.2. Practical skills

The following criteria should be evaluated:

- Accuracy of pharmacological assessment;
- Appropriateness of medicine selection;
- Correctness of dose calculations;
- Identification of contraindications;
- Recognition of clinically significant drug interactions;
- Assessment of adverse drug reactions;
- Interpretation of clinical and laboratory parameters;
- Ability to justify pharmacotherapeutic decisions;
- Application of evidence-based medicine;
- Development of appropriate monitoring plans.

12.3. Assessment of situational tasks

Criterion	Maximum points
Identification of the main medication-related problem	2
Correct pharmacological explanation	2
Identification of risks and interactions	2
Appropriate monitoring recommendations	2
Scientific justification of the proposed approach	2
Total	10

13. Matrix of Assessment Tools and Learning Outcomes

Assessment tool	Knowledge	Skills	Practical competencies
Review questions	✓		
MCQs	✓	✓	
Situational tasks	✓	✓	✓
Dose calculations	✓	✓	✓
Drug interaction analysis	✓	✓	✓
Medication review	✓	✓	✓
Practical assignments	✓	✓	✓
Examination	✓	✓	✓

14. Methodological Recommendations for Examiners

Assessment should focus on the student's ability to apply clinical pharmacology principles to individual patients.

The examiner should evaluate whether the student can:

1. Explain the clinical rationale for selecting a medicine.
2. Justify an individualized dosing regimen.
3. Identify clinically significant interactions.
4. Recognize adverse drug reactions.
5. Interpret relevant laboratory and pharmacokinetic parameters.
6. Evaluate the efficacy and safety of treatment.

7. Propose appropriate monitoring measures.
8. Apply evidence-based medicine principles.

Particular attention should be paid to medication safety. Errors involving potentially dangerous dose calculations, failure to recognize major contraindications or inability to identify serious adverse drug reactions should be considered significant deficiencies.

15. Final Provisions

The Fund of Assessment Tools is intended for systematic evaluation of students' knowledge and practical competencies throughout the study of Clinical Pharmacology.

The assessment materials may be supplemented and updated according to changes in clinical guidelines, pharmacological evidence, national regulations and the educational programme.

All calculation exercises and situational cases are educational. Actual prescribing decisions must comply with current clinical guidelines, approved prescribing information, individual patient characteristics and applicable national regulations.

16. Recommended grading system

For the course syllabus (RPD), the following point distribution model can be used:

Компонент	Доля
Ongoing assessment: tests and oral questioning	20%
Clinical pharmacological cases	25%
Independent student work	15%
Dose calculations and practical assignments	10%
Interim assessment (examination)	30%
Total	100%