





Non-Commercial Educational Institution  
Educational-Scientific-Production Complex  
«International University of Kyrgyzstan»

Quality Management System  
Academic and methodological complex of the discipline  
«Nephrology»  
MEP of «General Medicine» ISM IUK

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**INTERNATIONAL UNIVERSITY OF KYRGYZSTAN**  
**INTERNATIONAL SCHOOL OF MEDICINE**  
**Department of Therapy**



**«APPROVED»**

Vice-Rector academic and  
Administrative affairs  
Prof. Musa kyzy Alina

“ ” \_\_\_\_\_ 2021

**THE WORK PROGRAM OF THE DISCIPLINE**  
**«NEPHROLOGY»**

Main educational program

specialty of **560001 General Medicine (for foreign citizens)**

*(code, direction name / specialty)*

qualification of the graduate: general practitioner

*(the qualification of the graduate is indicated in accordance with SES HPE)*

Full-time education

Course 3

Semester 6

Credit / Exam (6)

Total curriculum credits 2

Work program developer: PhD. Toktogula N. A.

*(position, full name)*

Reviewed and approved at a meeting of the department of Therapy

Minutes № \_\_\_\_\_ from «\_\_\_\_\_» \_\_\_\_\_ 2021

Head of the Department Baitova G. M.

*(full name, signature)*

Bishkek 2021



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The work program for the discipline «**Nephrology**» has been developed in accordance with the requirements of the SES HPE in the specialty 560001 General Medicine.

**The work program is agreed with** academic and methodological sector of the ISM Chief specialist \_\_\_\_\_

(full name)

(signature)

« \_\_\_\_ » \_\_\_\_\_ 20\_\_

**The work program is agreed with** the head of the main educational program in the direction / specialty \_\_\_\_\_

\_\_\_\_\_ (code, specialty name/direction)

Head of the MEP \_\_\_\_\_

(Full name)

(signature)

« \_\_\_\_ » \_\_\_\_\_ 20\_\_

**External review given** \_\_\_\_\_

\_\_\_\_\_ (place of work, position, academic degree, academic title, full name)

« \_\_\_\_ » \_\_\_\_\_ 20\_\_ (review is attached)

**The work program is agreed with** the ISM “IUK” Quality and Monitoring Department

Head of the QMD \_\_\_\_\_

(Full name)

(signature)

« \_\_\_\_ » \_\_\_\_\_ 20\_\_



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## 1. The work program of the academic discipline

### 1.1.Explanatory note

- **Mission of the ISM IUK** – *training of competent specialists in the field of medicine, consistent with international standards and traditions of medical ethics, ready for continuous professional growth using modern achievements of science and practice, to solve public health problems.*

#### **Annotation of the academic discipline**

The AMC for the "Nephrology" discipline is compiled in accordance with the Regulations on the Academic and Methodological Complex of the discipline, approved by the Protocol of the Academic Council No. 6 of October 20, 2020, by the Addendum to the Regulations on the modular grade-rating system for assessing the knowledge of students in the NCEI ESPC "IUK" (Protocol No. 42 of 07.26.2018, as well as on the basis of the State educational standard of higher professional education in the direction of "Medicine", approved by the Government Decree of 2015. The AMC of the "Nephrology" discipline was developed for third-year students in the direction of "General Medicine" 560001 in compliance with the requirements of the State Educational Standard of Higher Professional Education of the Ministry of Education and Science of the Kyrgyz Republic.

There is not a single condition and disease in which the kidneys are not "interested". In this case, most often, the dysfunction is masked by the symptoms of the underlying disease, or it proceeds latently. Timely identification of the main renal symptoms, verification of the disease and adequate treatment will not only improve the patient's quality of life, but will reduce the rate of progression of chronic renal failure of the natural outcome of all chronic diseases. Studying the discipline of nephrology will expand the understanding of the causes, the variety of manifestations, the subtleties of choosing therapy for various, currently most frequent injuries. This knowledge will be useful in any branch of medicine, regardless of the chosen specialization in the future.

The study of the discipline in the 3rd year is necessary for the preparation of a general practitioner who knows the basics of clinical research of a nephrological patient with subsequent symptoms and syndromes, who knows the basics of etiology, clinical picture, classification, treatment of the main, most common diseases of the kidneys and urinary tract and their prevention.

- **Goals and objectives of the discipline**



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**The purpose** of the training: to work out the skills of recognizing diseases, understanding their causes and mechanisms of development, choosing the tactics of patient management.

**Tasks:** to be able to identify the main renal syndromes, draw up a plan for laboratory and instrumental examination of the patient, formulate a diagnosis in accordance with modern classifications, outline a rational pharmacotherapy of the disease

• **Place of discipline in the structure of MEP (prerequisites, postrequisites).**

Requirements for the preliminary preparation of the student:

To study this academic discipline (module), you need the following knowledge, skills and abilities formed by previous disciplines:

- Pathophysiology, clinical pathophysiology
- Propedeutics of internal diseases
- Pharmacology
- Pathological anatomy
- Psychology and pedagogy
- Normal physiology

Subsequently, the knowledge gained in the course of studying the discipline "Nephrology" will be necessary in the study of disciplines: "Internal medicine", "Polyclinic therapy", production practice "Physician assistant".

**Competencies of students, formed as a result of mastering discipline, the planned results of mastering the discipline.**

The study of this academic discipline is aimed at the formation of the following students general cultural (GC), general professional (GPC) and professional (PC) competencies:

	code / content of competency	As a result of studying the academic discipline, students must to:
2	<b>PC-2</b> - is able and ready to conduct and interpret a survey,	<b>know:</b> - the basics of organizing outpatient and inpatient care for children, adolescents and adults,



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	physical examination, clinical examination, the results of modern laboratory and instrumental studies, to write a medical record of an adult outpatient and inpatient.	modern organizational forms of work and diagnostic capabilities of outpatient services; <b>be able to:</b> - collect anamnesis; interview the patient and his relatives, conduct a physical examination of the patient of various ages (examination, palpation, auscultation, blood pressure measurement, determination of pulse characteristics, respiratory rate, etc.); <b>master:</b> - methods of general clinical examination of patients;
3	<b>PC-3</b> - is able to conduct pathophysiological analysis of clinical syndromes, substantiate pathogenetically justified methods (principles) of diagnosis, treatment, rehabilitation and prevention among adults and children, taking into account their age and sex groups;	<b>know:</b> - the concepts of etiology, pathogenesis, morphogenesis, pathomorphosis of the disease in an adult and adolescent, the principles of classification of diseases; basic concepts of general nosology; <b>be able to:</b> - interpret the results of the most common methods of laboratory and functional diagnostics, thermometry to identify pathological processes in human organs and systems; <b>master:</b> - interpretation patients' results of laboratory, instrumental diagnostic methods;
<b>Diagnostic activity:</b>		
6	<b>PC-13</b> - is able to identify in patients the main pathological symptoms and syndromes of diseases, using knowledge of the basics of biomedical and clinical disciplines, taking into account the course of pathology in organs, systems of the body as a whole, to analyze the patterns of functioning of organs and	<b>know:</b> - functional systems of the human body, their regulation and self-regulation when exposed to the external environment in normal and pathological processes; the structure and function of the immune system in adults and adolescents, its age characteristics, mechanisms of development and functioning, the main methods of immunodiagnostics, methods for assessing the immune status and indications for the use of immunotropic therapy;



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	<p>systems in various diseases and pathological processes, use the algorithm for making a diagnosis (main, concomitant, complications), taking into account the ICD-10, carry out the main diagnostic measures to identify urgent and life-threatening conditions;</p>	<p><b>be able to:</b> - analyze the histophysiological assessment of the state of various cellular, tissue and organ structures in patients;</p> <p><b>master:</b> - interpretation patient's results of laboratory, instrumental diagnostic methods;</p>
<b>Treating activity:</b>		
7	<p><b>PC-14</b> - is able to perform basic therapeutic measures for the most common diseases and conditions in adults and children;</p>	<p><b>know:</b> - the clinical picture, features of the course and possible complications of the most common diseases occurring in a typical form in children, adolescents and adults;</p> <p><b>be able to:</b> - to substantiate the need for clinical and immunological examination of a sick adult and adolescent, to analyze the effect of drugs in terms of the totality of their pharmacological properties and the possibility of their use for therapeutic treatment of patients of different ages;</p> <p><b>master:</b> - an algorithm for setting a preliminary diagnosis of patients with their subsequent referral for additional examination and to specialist doctors; an algorithm for setting a detailed clinical diagnosis.</p>

**Requirements for the level of preparation of the student who completed the studying the program of this discipline.**

As a result of studying the basic part of the cycle, the student have to:

**know:**

- the definition of the disease, etiology, risk factors (RF), pathogenesis, pathomorphology, classification, clinical picture, laboratory and instrumental diagnostics, principles of treatment;

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- the etiology, pathogenesis, clinic, diagnostic methods and emergency care of urgent conditions;
- to list the complications of diseases.
- the principles of drug therapy, indications and contraindications for the use of drugs (Treatment Agent).
- the prognosis of diseases, RF of development of life-threatening conditions.

**Understand:**

- the pathogenesis of the formation of certain syndromes and symptoms in nephrology, pathomorphology of the main syndromes;
- the results of laboratory and instrumental diagnostic methods;
- the principles of emergency care for nephrological patients;
- the principles of drug therapy and principles of treatment control.

**Able to use:**

- the methods of physical examination for making a preliminary diagnosis and determining a plan for the examination of a nephrological patient;
- the results of laboratory and instrumental studies in determining the tactics of treatment;
- the data of an objective examination and the results of the patient's study in writing a student's medical history with a substantiation of the clinical diagnosis.

**Able to carry out:**

- the recognition and correct diagnosis of the most common nephrological syndromes in their typical course;

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- the assessment of the activity of the pathological process, its form, stage and phase of the course in accordance with the officially approved classifications, the severity of complications;
- the drawing up a plan for laboratory and instrumental examination to confirm the alleged diagnosis and interpret the results obtained;
- the formulation a detailed clinical diagnosis, guided by the modern classification of diseases;
- the detailed diagnosis in a particular patient, exactly, the etiology, mechanism of development and pathomorphology of the disease, to highlight complications.

**Able to analyze:**

- the substantiation of the underlying disease of the clinical diagnosis in a particular patient with an assessment of the examination results and identify the criteria for the diagnosis of this disease;
- the substantiation of the etiology of the disease in the patient;
- the appointment of adequate individual therapy by filling out the "Prescription sheet" and "Temperature sheet" of the supervised patient;
- the clinical manifestations of some emergency conditions, to carry out a detailed condition, urgent diagnostics and have the skills to provide emergency medical care.

**Able to evaluate:**

- the scheme of non-and drug treatment of the patient in accordance with the diagnosis and morphological changes, including determining the indications and therapeutic contraindications for surgical intervention, and its urgency;
- the prognosis of the disease for the life of a particular patient;

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- measures of primary and secondary prevention; the latter (including) in the supervised patient;

### **Master:**

- the methodology for collecting complaints and anamnesis of the patient;
- the methods of propaedeutics of various body systems: examination, palpation, percussion and auscultation of internal organs;
- the skills of interpreting the anamnesis data, objective examination of the patient, his laboratory and instrumental data;
- the skills of presenting an independent point of view, analysis and logical thinking, public speech, ethical argumentation, conducting discussions and round tables, the principles of medical deontology and medical ethics;
- the skills of informing the patient and their relatives;
- the foreign language in the volume for communication and obtaining information from foreign sources.

### **1.2. Recommended educational technologies**

The following types of educational work are used: lecture-visualization, lecture, press conference, trainings, debates among students, master classes, discussions of various formats, business and role-playing educational games, small group method, classes using simulators, dummies, imitators, analysis of clinical cases, preparation and defense of medical history, participation in research work, conducting subject Olympiads, preparation and defense of abstracts.

### **1.3. The scope of the discipline and types of academic work**

Form of education – full time



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Academic plan for 2015	6 sem.	Total	
		in hours	in credits
<b>Total labor intensity</b>	<b>56</b>	<b>56</b>	<b>1,86</b>
<b>Classroom works</b>	32	32	1,06
Lectures	12	12	0,4
Practical classes	20	20	0,66
Independent work	12	12	0,4
SIWT	12	12	0,4
<b>Type of final control</b>			Exam

#### 1.4. Structure of Discipline

Course	Semester	Number of Credits	Quantity of Academic hours		Independent work		Total hours
			Lecture	Practical classes	SIW	SIWT	
3	6		12	20	12	12	56
<b>TOTAL</b>			<b>12</b>	<b>20</b>	<b>12</b>	<b>12</b>	<b>56</b>

##### 1.4.1. Thematic plan for studying the Discipline.

№	Name of sections and topics of disciplines (lectures and practical classes)	Quantity of academic hours			Individual work			Formed Competencies	Used edu. techs, means and methods of edu.	Form of control
		Lectures	Practical classes	Total classroom hours	SIWT	SIW	TOTAL HOURS			



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1	Anatomy and physiology of the kidney. Methods of examination of a nephrological patient. Major syndromes in nephrology (lec., prac.)  Kidney abnormality (SIWT)	1	2	3	1	1	5	PC-2, PC -3, PC-13, PC -14	video lecture, debate, brainstorming	Testing, case studies, assessing the development of practical skills (abilities)
2	Glomerulonephritis (lec., prac.)	2	2	4	2	2	6	PC-2, PC-3, PC-13, PC-14	Video lectures	
3	Pyelonephritis (lec., prac.)	1	2	3	1	1	5	PC-2, PC-3, PC-13, PC-14	Debates, video lectures	Testing, case studies, assessing the development of practical skills (abilities)



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4	<p>Amyloidosis. Classification of the causes of the development of amyloidosis, clinical manifestations, laboratory and instrumental methods for diagnosing amyloidosis (lec., prac.)</p> <p>Cystic kidney disease (SIW)</p>	1	2	3	1	1	5	PC-2, PC-3, PC-13, PC-14	Video lectures, brainstorming	Testing, case studies, assessing the development of practical skills (abilities)
5	<p>Tubulointerstitial nephropathy Clinic of acute and chronic TIN. Laboratory and instrumental diagnostics. Principles of therapy (lec., prac.)</p> <p>Reflux nephropathy (SIW)</p>	2	2	4	1	1	6	PC-2, PC-3, PC-13, PC-14	Video lectures, debates	Testing, case studies, assessing the development of practical skills (abilities)



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<p>6 Kidney damage in metabolic and systemic diseases (lec)</p> <p>Diabetic nephropathy. Stages of DN development, clinical presentation, early clinical and laboratory diagnosis. Prevention and modern methods of treatment of DN (practical)</p> <p>Kidney damage in systemic vasculitis, with Shenlein-Henoch purpura, thrombotic microangiopathies, Sjogren's syndrome (practical)</p> <p>Medicinal nephropathy (practical)</p> <p>Modern concepts of nephroprotective therapy (SIW)</p> <p>SLE with kidney involvement (SIWT)</p>	2	2	4	1	1	7	PC-2, PC-3, PC-13, PC-14	Video lectures, debates, brainstorming	Testing, case studies, assessing the development of practical skills (abilities)
<p>7 Acute renal failure (Lecture, practical)</p> <p>Principles of conservative management of a patient with acute renal failure. Dialysis therapy for patients with acute kidney injury (SIWT)</p> <p>Dysmetabolic nephropathy. Kidney damage in alcoholism and drug addiction (SIW)</p>	1	2	3	1	1	6	PC-2, PC-3, PC-13, PC-14	Video lectures, debates	Testing, case studies, assessing the development of practical skills (abilities)



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8	Chronic renal failure. Modern concepts of etiopathogenesis of chronic renal failure. Clinic, diagnosis of chronic renal failure (lec, praC)  APS and disseminated intravascular coagulation syndrome in nephrological practice (SIWT)	1	2	3	1	1	5	PC-2, PC-3, PC-13, PC-14	Video lectures	Testing, case studies, assessing the development of practical skills (abilities)
9	Kidney stone disease (lec, prac)  Diet therapy for kidney disease (SIW)  Kidney transplant (SIWT)	1	2	3	1	1	5	PC-2, PC-3, PC-13, PC-14	Video lectures	Testing, case studies, assessing the development of practical skills (abilities)
10	Emergencies in nephrology (practice)  Nephrotic crisis (SIW)		2	2	2	2	5	PC-2, PC-3, PC-13, PC-14	Video lectures, brainstorming	Testing, case studies, assessing the development of practical skills (abilities)
	<b>Total for the semester</b>	<b>12</b>	<b>20</b>	<b>32</b>	<b>12</b>	<b>12</b>	<b>56</b>			<b>Control work, tests</b>
	<b>TOTAL</b>	<b>12</b>	<b>20</b>	<b>32</b>	<b>12</b>	<b>12</b>	<b>56</b>			



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## 1.4.2. Organization of Student's Individual Work

№	SIW topic	The task for the SIW (essay, report, abstract, tables, presentation, note-taking, extracts, crossword puzzles, studying the medical history, solving situational problems, exercises, cases, preparing for business games, testing on the topic)	Recommended Literature	Deadlines (week number)
1.	Cystic kidney disease (SIW)	solving situational problems, presentation, report, film demonstration	1. Diagnostic Atlas of Renal Pathology, Fogo, Agnes B 7th ED. Elsevier, 2005  2. Clinical Dialysis, Nissenson, Allen R, 4th ED. Mc Graw Hill, 2005  3. Hypertension companion to to Brenner & Rectors the Kidney, Oparil, Suzanne, 2nd Ed. Elsevier, 2005  4. Nephrology Secrets, Brown, David E, 2nd ED. Elsevier, 2003  5. Tarafdar Surjit (ed.) Lecture Notes: Nephrology  6. Harber Mark (ed.) Practical Nephrology	2
2.	Reflux nephropathy (SIW)	solving situational problems, presentation	1. Diagnostic Atlas of Renal Pathology, Fogo, Agnes B 7th ED. Elsevier, 2005	3



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			<p>2. Clinical Dialysis, Nissenson, Allen R, 4th ED. Mc Graw Hill, 2005</p> <p>3. Hypertension companion to to Brenner &amp; Rectors the Kidney, Oparil, Suzanne, 2nd Ed. Elsevier, 2005</p> <p>4. Nephrology Secrets, Brown, David E, 2nd ED. Elsevier, 2003</p> <p>5. Tarafdar Surjit (ed.) Lecture Notes: Nephrology</p> <p>6. Harber Mark (ed.) Practical Nephrology</p>	
3.	Kidney abnormality	solving situational problems, presentation, report, film demonstration	<p>1. Diagnostic Atlas of Renal Pathology, Fogo, Agnes B 7th ED. Elsevier, 2005</p> <p>2. Clinical Dialysis, Nissenson, Allen R, 4th ED. Mc Graw Hill, 2005</p> <p>3. Hypertension companion to to Brenner &amp; Rectors the Kidney, Oparil, Suzanne, 2nd Ed. Elsevier, 2005</p> <p>4. Nephrology Secrets, Brown, David E, 2nd ED. Elsevier, 2003</p>	4
4	Glomerulonephritis	solving situational problems, presentation, report, film demonstration	<p>1. Diagnostic Atlas of Renal Pathology, Fogo, Agnes B 7th ED. Elsevier, 2005</p>	5



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			<p>2. Clinical Dialysis, Nissenson, Allen R, 4th ED. Mc Graw Hill, 2005</p> <p>3. Hypertension companion to to Brenner &amp; Rectors the Kidney, Oparil, Suzanne, 2nd Ed. Elsevier, 2005</p> <p>4. Nephrology Secrets, Brown, David E, 2nd ED. Elsevier, 2003</p> <p>5. Tarafdar Surjit (ed.) Lecture Notes: Nephrology</p> <p>6. Harber Mark (ed.) Practical Nephrology</p>	
5	Dysmetabolic nephropathy. Kidney damage in alcoholism and drug addiction (SIW)	solving situational problems, presentation, report, film demonstration	<p>1. Diagnostic Atlas of Renal Pathology, Fogo, Agnes B 7th ED. Elsevier, 2005</p> <p>2. Clinical Dialysis, Nissenson, Allen R, 4th ED. Mc Graw Hill, 2005</p> <p>3. Hypertension companion to to Brenner &amp; Rectors the Kidney, Oparil, Suzanne, 2nd Ed. Elsevier, 2005</p> <p>4. Nephrology Secrets, Brown, David E, 2nd ED. Elsevier, 2003</p> <p>5. Tarafdar Surjit (ed.) Lecture Notes: Nephrology</p> <p>6. Harber Mark (ed.) Practical Nephrology</p>	6



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6	Diet therapy for kidney disease (SIW)	solving situational problems, presentation, report, film demonstration	1. Tarafdar Surjit (ed.) Lecture Notes: Nephrology  2. Harber Mark (ed.) Practical Nephrology	7
7	Nephrotic crisis (SIW)	solving situational problems, presentation, report, film demonstration	1. Diagnostic Atlas of Renal Pathology, Fogo, Agnes B 7th ED. Elsevier, 2005  2. Clinical Dialysis, Nissenson, Allen R, 4th ED. Mc Graw Hill, 2005  3. Hypertension companion to to Brenner & Rectors the Kidney, Oparil, Suzanne, 2nd Ed. Elsevier, 2005  4. Nephrology Secrets, Brown, David E, 2nd ED. Elsevier, 2003  5. Tarafdar Surjit (ed.) Lecture Notes: Nephrology  6. Harber Mark (ed.) Practical Nephrology	8
8	DIC syndrome in nephrological practice	solving situational problems, presentation, report, film demonstration	1. Diagnostic Atlas of Renal Pathology, Fogo, Agnes B 7th ED. Elsevier, 2005  2. Clinical Dialysis, Nissenson, Allen R, 4th ED. Mc Graw Hill, 2005  3. Hypertension companion to to Brenner & Rectors the Kidney, Oparil, Suzanne, 2nd Ed.	9

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			Elsevier, 2005  4. Nephrology Secrets, Brown, David E, 2nd ED. Elsevier, 2003  5. Tarafdar Surjit (ed.) Lecture Notes: Nephrology  6. Harber Mark (ed.) Practical Nephrology	
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### 1.4.3. Evaluative Assessment Tools

- Current and midterm (modular) control - carried out during a certain period of study, semester or module in accordance with the calendar schedule. The following assessment tools are used for current and midterm control of progress, including for monitoring the student's individual work): tasks in a test form, case studies, control questions for written control or interviews, control works (tasks), topics of essays, reports, essays, etc.
- Final control - is carried out at the end of the study of the academic discipline or part of the discipline at the end of the semester. Evaluation tools used for an exam or credit based on the results of mastering the discipline: tasks in a test form, case studies, control questions and tasks, a list of practical skills, etc.

### Course tests

1. What is the main etiological factor of acute glomerulonephritis:
  - a. staphylococcus aureus
  - b. klebsiella
  - c. hemolytic streptococcus group A
  - d. Pseudomonas aeruginosa
  - e. pneumococcus
2. How long after the infection does acute glomerulonephritis develop?
  - a. 10-12 days



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b. 3-4 days

c. 7 days

d. 30 days

e. 2 mont

3. Which of the following factors cause the development of acute glomerulonephritis? a) whey; b) vaccine; c) insect poison; d) medicinal substances; e) food products. Choose the correct combination of answers:

a.a, b

b. a, b, e

c. a, d

d. all answers are correct

4. Which age group is most susceptible to acute glomerulonephritis?

a.up to 2 years old

b. from 2 years of age to 40 years

c. menopause

d. the period of menopause

e. puberty

5. Hemodynamic disturbances in acute glomerulonephritis are caused by: a) hypervolemia; b) sodium and water retention; c) hypovolemia; d) an increase in the concentration of prostaglandins; e) vasospasm. Choose the correct combination of answers:

a.a, e

b. a, b

c. a, b, d

d.b, d

5.a, b, e

6. What does the classic triad of symptoms of acute glomerulonephritis include? a) edema; b) shortness of breath; c) hypertension; d) hematuria; e) heartbeat. Choose the correct combination of answers:

a.a, c, d

b.c, d, e



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c. a, d, e

d. a, b, c

7. Clinical manifestations of facies nephritica are: a) facial edema; b) acrocyanosis; c) hemorrhagic rash on the face; d) pallor of the skin; e) swelling of the cervical veins. Choose the correct combination of answers:

a.a, c, d

b. a, b, c

c. a, b, e

d. a, d

e.a, c, d

8. Typical hemodynamic disorders in acute glomerulonephritis: a) expansion of the heart cavities; b) accent I tone over the aorta; c) low diastolic pressure; d) low pulse pressure; e) Graham-Still noise. Choose the correct combination of answers:

aa, b

b. a, c

c. a, b, d

d. a, b, c, d

e.a, d, e

9. Leading importance in the pathogenesis of hypertension in acute glomerulonephritis is given to: a) sodium and water retention; b) an increase in the BCC and stroke volume of the heart; c) narrowing of the renal arteries (vasorenal mechanism); d) hypercatecholaminemia and an increase in catecholamines; e) an increase in the level of cortisol in the blood. Choose the correct combination of answers:

a. a, c

b. a, b, c

c.c, d

d. a, c, d

e.a, b

10. Pain in the lumbar region in acute glomerulonephritis may be associated with: a) the presence of calculi in the urinary system; b) with swelling of the kidneys; c) with apostematous changes in the renal parenchyma; d) with impaired urodynamics; e) with ischemic renal infarction. Choose the correct combination of answers:



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a. b, d, e

b. d, d

c. b, d

d. a, c, d

e.a, b, d

11. What signs are characteristic of acute glomerulonephritis: a) isostenuria; b) an increase in urine density; c) alkaline urine reaction; d) an increase in neutrophils in the urine; e) an increase in lymphocytes in the urine. Choose the correct combination of answers:

a.a, b

b. a, c

c. a, d

d. b, c

e.a, d

12. What immunological changes are observed in post-streptococcal glomerulonephritis? a) high titers of antibodies to streptococcus antigens; b) an increase in the titer of renal autoantibodies; c) the presence of antinuclear antibodies; d) low levels of complement; e) high levels of complement. Choose the correct combination of answers:

a.a, b, c, d

b. a, b, c, e

c. a, b

d. a, d

e.a, d

13. Name the complications of acute glomerulonephritis: a) oligoanuria in the acute phase of the disease with the development of acute renal failure; b) massive renal bleeding; c) eclampsia; d) thromboembolic syndrome; e) acute left ventricular failure. Choose the correct combination of answers:

a. a, b, c

b. a, d

c. a, d, e

d. a, c, d

e.a, c, d, e



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14. What are the indications for the appointment of glucocorticoids in acute glomerulonephritis:

- a. edema
- b. the presence of nephrotic syndrome without severe hematuria and hypertension
- c. arterial hypertension
- 4. macrohematuria

15. What are the goals of prescribing anticoagulants and antiplatelet agents in acute glomerulonephritis? a) prevention of coronary thrombosis; b) prevention of thromboembolic syndrome; c) impact on the processes of local intraglomerular intravascular coagulation; d) prevention of renal artery thrombosis; e) increased perfusion of ischemic glomeruli. Choose the correct combination of answers:

- a. a, d
- b. a, b, c, d, e
- c. a, b, c
- d. a, b, c, d
- e. b, c, d, e

16. What dietary measures are indicated for acute glomerulonephritis?

- a. limiting sodium chloride to 1.5 g / day
- b. an increase in sodium chloride consumption
- c. an increase in the amount of fluid consumed
- d. increasing consumption of K<sup>+</sup>-containing products

17. The diagnostic criteria for nephrotic syndrome are: a) proteinuria more than 3.5 g / day; b) hypoalbuminemia; c) hypergammaglobulinemia; d) hypercholesterolemia; e) hyper- $\gamma$ -globulinemia. Choose the correct combination of answers:

- a. a, c, e
- b. d
- c. a, e
- d. a, b
- e. a, b, d

18. Nephrotic syndrome is caused by: a) chronic glomerulonephritis; b) amyloidosis; c) pulmonary tuberculosis; d) renal vein thrombosis. Choose the correct combination of answers:



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a.a, b

b. a, b, c, d

c. a, b, d

d. c, d

e.a, d

19. Nephrotic syndrome can occur in the following diseases: a) diabetes mellitus; b) myeloma; c) amyloidosis; d) hemorrhagic vasculitis; e) tumors of extrapulmonary localization. Choose the correct combination of answers:

A b, c, d

b. all answers are correct

c. b, c

d. c, d

e.a, d

20. What systemic diseases are complicated by nephrotic syndrome? a) systemic lupus erythematosus; b) rheumatoid arthritis; c) dermatomyositis; d) periarteritis nodosa; e) scleroderma. Choose the correct combination of answers:

a.a, e

b. a, d, e

c. b, c

d. a, b, d, e

e.a, b, c

21. The main symptom of nephrotic syndrome is:

a. leukocyturia

b. proteinuria

c. hematuria

d. cylindruria

e. bacteriuria



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22. What is the cause of hypoproteinemia in nephrotic syndrome? a) loss of proteins in the urine; b) enhanced synthesis of  $\gamma$ -globulins; c) the movement of proteins from plasma into the extracellular fluid; d) loss of protein through the edematous intestinal mucosa; e) increased catabolism of globulins. Choose the correct combination of answers:

a.a, c, d

b. a, d

c. a, d, e

d. d, d

e. all answers are correct

23. Pathogenetic drugs for the treatment of nephrotic syndrome include: a) diuretics; b) glucocorticoids; c) protein preparations; d) cytostatics; e) anticoagulants. Choose the correct combination of answers:

a.b, d

b. a, b, e

c. b

d. d

24. Steroid therapy is contraindicated in: a) pelvic nephrotic syndrome; b) amyloidosis; c) drug nephrotic syndrome; d) diabetic nephrotic syndrome; e) glomerulonephritis. Choose the correct combination of answers:

a.b, d

b. b, c, d

c. a, d

d. a, c, d

e.+b, d

25. Cytostatics for the treatment of nephrotic syndrome are indicated for: a) membranous nephritis; b) nodular periarteritis; c) suppurative diseases; d) nephritis in systemic diseases; e) exacerbation of latent infection. Choose the correct combination of answers:

a.a, b

b. b, d

c. a, d

d. d



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e.a, b, d

26. What organs are most often affected in amyloidosis? a) kidney; b) heart; c) intestines; d) spleen; e) liver. Choose the correct combination of answers:

a.a, d, e

b. a, d

c. a, e

d. all answers are correct

e.a, b, d

27. What is the earliest symptom in amyloidosis?

a.proteinuria

b. hematuria

c. leukocyturia

d.cylindruria

e. isostenuria

28. What changes in the protein composition of the blood are observed in amyloidosis? a) lipoproteinemia; b) hypergamma globulinemia; c) hypoalbuminemia. Choose the correct combination of answers:

a.a, b, c

b. a, b

c. b, c

d.b

e.a, c

29. What tissue biopsy in amyloidosis is most informative in the early stages? a) gums; b) rectal mucosa; c) liver; d) kidneys; e) skin. Choose the correct combination of answers:

a.a, b

b. b, d

c. a, b, d

d. d, d

e. in, g



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30. Treatment of patients with amyloidosis with drugs of the aminoquinolone series is shown:

- a. in the early stages
- b. in the later stages
- c. regardless of the stage of the disease

31. Pathophysiological mechanisms of progression of glomerulonephritis: a) activation of humoral immune processes; b) production of inflammatory mediators; c) coagulation mechanism; d) hemodynamic mechanism; e) metabolic disorders. Choose the correct combination of answers:

- a. b, c
- b. b, c, d
- c. all answers are correct
- d. a, b, c
- e. a, b, c, d

32. The source of the production of inflammatory cytokines in glomerulonephritis are: a) mesangial cells; b) mononuclear leukocytes; c) platelets; d) polynuclear leukocytes. Choose the correct combination of answers:

- a. b, d
- b. a, b, c
- c. b, c, d
- d. a, b, c, d
- e. a, d

33. What factors have a direct damaging effect on the tubules and interstitium in glomerulonephritis? a) proteinuria; b) erythrocyturia; c) transferrinuria; d) deterioration of the blood supply to the tubules. Choose the correct combination of answers:

- a. a, b
- b. a, b, c, d
- c. a, b, c
- d. a, d
- e. a, c, d



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34. Among the hemodynamic factors of the progression of glomerulonephritis are: a) intraglomerular hypertension; b) systemic hypertension; c) violations of the permeability of the vascular wall; d) immunocomplex damage. Choose the correct combination of answers:

- a.a, b
- b.c, d
- c. a, b, c, d
- d. a, c, d
- e.a, d

35. Metabolic disorders: a) are most often observed in hematuric chronic glomerulonephritis; b) are associated primarily with a change in the content of blood lipids; c) are most typical for nephrotic chronic glomerulonephritis; d) lead to the deposition of LDL in the kidneys;

- a. b, d
- b. a
- c. a, b, d
- d. b, c,
- e.c, d

36. The most active nephritis in chronic glomerulonephritis is diagnosed in the presence of:

- a. +massive proteinuria > 3.5 g / day
- b. long-term persistent acute nephritic syndrome
- c. massive erythrocyturia with moderate proteinuria
- d. persistent high arterial hypertension

37. Inactive nephrotic type of chronic glomerulonephritis is characterized by: a) absence of erythrocyturia; b) hematuria of varying severity; c) moderate proteinuria; d) persistent high arterial hypertension; e) intermittent benign arterial hypertension. Choose the correct combination of answers:

- a.a, c, e
- b. b, c, e
- c. a, d
- d. d
- e.a, b, c, e



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38. The most prognostically favorable are the types of chronic glomerulonephritis: a) nephrotic; b) nephrotic-hypertensive; c) the most active nephritic; d) active nephritic; e) inactive nephritic. Choose the correct combination of answers:

a.a, e

b. a, b, e

c. b, d

d. a

e.d

39. The following morphological types of chronic glomerulonephritis are most prognostically favorable: a) membranous nephropathy; b) focal segmental glomerulonephritis; c) mesangiocapillary glomerulonephritis; d) mesangio-proliferative glomerulonephritis; e) minimal changes in the glomeruli. Choose the correct combination of answers:

a.a, b

b.c, d, e

c.c, d

d. a, e

e.a, d, e

40. For the treatment of chronic glomerulonephritis currently used: a) glucocorticoids; b) heparin; c) Ace-in d) indomethacin; e) cytostatics. Choose the correct combination of answers:

a.a, e

b. a, b, e

c. a, b, c, e

d. a, d

e.a, b, d

41. The duration of treatment for chronic glomerulonephritis is:

a. several weeks

b. 2-3 months

c.6 months

dfrom 6 months to 2 years



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42. In the treatment of chronic glomerulonephritis: a) of all steroid forms, methylprednisolone is preferable; b) cytostatics are used in any case; c) cytostatics often worsen renal function; d) extracorporeal cleansing methods are of secondary importance. Choose the correct combination of answers:

- a.a, c, d
- b. a, b
- c. b, d
- d. a, b, c, d
- e.a, d

43. With what frequency does chronic glomerulonephritis develop as an outcome of acute glomerulonephritis?

- a. 80-90%
- b. 50%
- c. 25%
- d. 100%
- e.in 10-20%

44. What type of immunological reactions is more often than in 75-80% of cases caused by damage to the glomeruli in chronic glomerulonephritis?

- a. the production of antibodies to the basement membrane of the glomeruli
- b. the appearance of immune complexes in the glomeruli
- c. the appearance of antibodies to the tubular basement membrane

45. At what morphological type of chronic glomerulonephritis changes in structures are not detected during light-optical examination?

- a.mesangioproliferative
- b. mesangiocapillary
- c. membranous
- d. minimal changes in the glomeruli
- e. fibroplastic

46. Which of the clinical variants of chronic glomerulonephritis is the most common?

- a.hematuric



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b. latent

c. nephrotic

d. hypertensive

e.+mixed

47. What proteinuria is characteristic of chronic glomerulonephritis?

a.glomerular

b.+tubular

c. Proteinuria overflow

d. exertional proteinuria

48. What variant of chronic glomerulonephritis may not be accompanied by the development of chronic renal failure?

a. latent

b. hematuric

c. hypertensive

d. nephrotic

e.mixed

49. What test can reveal a decrease in glomerular filtration in chronic glomerulonephritis?

a. test according to Nechiporenko

b. test of Zimnitsky

c. Reberg-Tareev test

d. Addis-Kakovsky test

e.Amburge test

50. What type of chronic glomerulonephritis is often manifested by recurrent acute nephritic syndrome?

a.mesangioproliferative

b. mesangiocapillary

c. membranous

d. minimal changes in the glomeruli



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e. fibroplastic

51. What complications are typical for the nephrotic form of chronic glomerulonephritis? a) pyonephrosis; b) necrosis of the renal papillae; c) hypovolemic shock; d) acute renal vein thrombosis; e) acute heart failure. Choose the correct combination of answers:

a. a, d

b. b, c

c. a, b

d. c, d, e

e.a, b, c

52. What signs make it possible to distinguish chronic from acute glomerulonephritis? a) the presence of dysuric phenomena; b) severe left ventricular hypertrophy; c) a decrease in the size of the kidneys; d) severe leukocyturia; e) lowering blood pressure. Choose the correct combination of answers:

a.a, d

b. a, c, d

c. a, b, c, d

d. a

e.b, c

53. What signs make it possible to distinguish chronic glomerulonephritis from chronic pyelonephritis? a) fever with chills; b) asymmetry of kidney damage; c) the absence of asymmetry of kidney damage; d) high proteinuria combined with hematuria and cylindruria; e) high leukocyturia, bacteriuria. Choose the correct combination of answers:

a.c, d

b. a, b, e

c. a, d, e

d. a, c, d

e.a, c, d, e

54. What are the characteristic signs of chronic glomerulonephritis that make it possible to distinguish it from hypertension? a) anticipatory urinary syndrome increase in blood pressure; b) urinary syndrome preceding an increase in blood pressure; c) frequent development of vascular complications (stroke, heart attack); d) rare hypertensive crises; e) pronounced changes in the fundus. Choose the correct combination of answers:

a. a, c, e



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b. b, d

c. a, d

d. d, d

e. b, c, d

55. What signs help to distinguish nephrotic variant of glomerulonephritis from cardiac edema (congestive kidneys)? a) absence of heart disease; b) localization of edema on the lower extremities; c) enlargement of the liver; d) daily proteinuria more than 3 grams. Choose the correct combination of answers:

a. a

b. b, c, d

c. a, b, c, d

d. b, c

e. a, d

56. What signs can distinguish kidney cancer from hematuric chronic glomerulonephritis? a) total painless hematuria in combination with fever; b) increased ESR and erythrocytosis; c) hypotension; d) selective proteinuria; e) low specific gravity of urine. Choose the correct combination of answers:

a. a, b, d, e

b. a, b

c. b, c, d

d. a, b, d

e. b, d

57. What drugs are included in the four-component regimen used in the treatment of patients with chronic glomerulonephritis? a) heparin; b) ACE-in; c) corticosteroids; d) indomethacin; e) cytostatics. Choose the correct combination of answers:

a. a, b, c, d

b. b, c, d

c. a, b, d, e

d. a, b, c, e

e. a, c, d, e



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58. Indications for the appointment of corticosteroids in chronic glomerulonephritis: a) high activity of the renal process; b) nephrotic syndrome without hypertension and hematuria; c) isolated proteinuria; d) isolated hematuria; e) hypertensive syndrome. Choose the correct combination of answers:

- a. a, d
- b. a, e
- c. a, c
- d. d, d
- e. a, b

59. In what morphological variant of chronic glomerulonephritis are corticosteroids most indicated?

- a. fibroplastic
- b. mesangiocapillary
- c. focal segmental glomerulosclerosis
- d. membranous
- e. minimal changes in the glomeruli

60. Indications for the appointment of cytostatics in chronic glomerulonephritis: a) nephrotic syndrome in chronic glomerulonephritis - steroid-resistant forms; b) active forms of jade; c) severe hematuria; d) isolated proteinuria; e) end-stage renal failure. Choose the correct combination of answers:

- a. a, b
- b. a, b, c, e
- c. a, d
- d. a, b, d
- e. a, b, c

61. What signs carry information about the functional abilities of the kidney? a) protein content in urine; b) isostenuria; c) decreased glomerular filtration; d) increased urea; e) increase in plasma creatinine. Choose the correct combination of answers:

- a. a, c, d, e
- b. b, c, d, e
- c. all answers are correct
- d. d
- e. c, d



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62. Changes in biochemical parameters in chronic renal failure:

- a. hyperalbuminemia
- b. dyslipidemia
- c. hypercreatininemia
- d. urobilinuria
- e. hyperbilirubinemia

63. Signs characteristic of uremic pericarditis: a) increased body temperature; b) pain in the region of the heart; c) pericardial friction noise; d) tachycardia; e) accumulation of hemorrhagic fluid in the pericardial cavity. Choose the correct combination of answers:

- a. all answers are correct;
- b. a, d
- c. b, c, d, e
- d. a, c, d

64. Causes of anemia in chronic renal failure: a) hemolysis; b) folic acid deficiency; c) iron deficiency; d) lack of erythropoietin. Choose the correct combination of answers:

- a. a, d
- b. a, b, c, d
- c. a, b, d
- d. c, d
- e. b, c, d

65. What determines the development of hemorrhagic syndrome in chronic renal failure? a) thrombocytopenia; b) thrombocytopathy; c) decrease in prothrombin; d) decrease in factor IV, platelets; e) hyperkalemia. Choose the correct combination of answers:

- a. a, d
- b. c, d, e
- c. a, c, d
- d. a, c, d, e
- e. a, b, d

66. Changes in the bone apparatus in chronic renal failure: a) hyperostosis; b) osteomalacia; c) osteoporosis; d) osteosclerosis; e) pathological fractures. Choose the correct combination of answers:



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a. b, c, e

b. in, d

c. a, e

d. b, c, e

e. a, d

67. The level of glomerular filtration characteristic of end-stage chronic renal failure:

a. 40 ml / min

b. 30 ml / min

c. 20 ml / min

d. 15 ml / min

e. 5 ml / min

68. What determines the dark and yellowish color of the skin in chronic renal failure?

a. from an increase in direct bilirubin

b. from an increase in indirect bilirubin

c. from violation of the release of urochromes

d. from violation of conjugated bilirubin

e. from a violation of the secretion of bilirubin

69. Groups of drugs used in chronic renal failure: a) antihypertensive drugs; b) antibiotics; c) steroid hormones; d) potassium-sparing diuretics; e) anabolic hormones. Choose the correct combination of answers:

a. all answers are correct

b. in, d

c. a, c, d

d. b, c, e

e. a, b, c, e

70. What antibiotics are advisable to prescribe for chronic renal failure? a) tetracycline; b) penicillin; c) oxacillin; d) gentamicin; e) streptomycin. Choose the correct combination of answers:

a. c, d

b. a, b



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c. b, c

d. c, d, e

e.a, d

71. What antibacterial agents are contraindicated in patients with chronic renal failure? a) anti-tuberculosis drugs; b) nitrofurans; c) gentamicin; d) semi-synthetic penicillins; e) cephalosporins. Choose the correct combination of answers:

a.a, b, c

b. d, d

c. a, c

d.b, d

e.a, b, e

72. What should be the caloric content of the daily diet prescribed to a patient with chronic renal failure in order to prevent the breakdown of their own protein?

a.100-1800 kcal

b.1800-2200 kcal

c.2200-2500 kcal

d. 2500-3000 kcal

e. 3000-3500 kcal

73. What complications occur during hemodialysis? a) pericarditis; b) neuritis; c) arterial hypertension; d) osteodystrophy; e) infections. Choose the correct combination of answers:

a.a, d

b. a, b, d, e

c. a, d, e

d. a, c, d

e.b, d

74. Which group of antibiotics most often causes acute renal failure?

a. penicillins

b. cephalosporins

c. aminoglycosides



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d. macrolides

e. tetracycline

75. Causes of acute renal failure when prescribing non-steroidal anti-inflammatory drugs: a) loss of intracellular Ca; b) an obstacle to the synthesis of prostaglandins; c) massive proteinuria; d) violation of hemodynamics; e) decreased renal blood flow. Choose the correct combination of answers:

a. a, b

b. a, b, e

c. a, b, c, e

d. d, d

e. b, d

76. The main causes of acute renal failure in glomerulonephritis: a) edema of interstitial tissue; b) obturation of the tubules with protein masses; c) massive proteinuria; d) violation of hemodynamics; e) increased blood viscosity. Choose the correct combination of answers:

a. a, b

b. all answers are correct

c. d, d

d. b, d

e. b, d, d

77. Causes of acute renal failure in patients with multiple myeloma: a) proliferation of the ureters by tumor masses; b) hypercalcemia; c) blockade of tubules with protein casts; d) blockade of tubules with urates. Choose the correct combination of answers:

a. a, b

b. a, b, c

c. a, b, c, d

d. b, c, d

e. b, c

78. Signs of acute renal vein thrombosis: a) fever; b) back pain; c) dyspeptic disorders; d) the kidney is reduced in size; e) the kidney is enlarged. Choose the correct combination of answers:

a. a, b, e

b. a, b, d



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c. a, b

d. b, c

e.a, b, c, e

79. Signs characteristic of the oliguric stage of acute renal failure: a) anorexia; b) bloating of the intestines; c) hyperkalemia; d) hypokalemia; e) azotemia. Choose the correct combination of answers:

a. a, d

b. c, d, e

c. b, c, e

d. d

e.a, b, c, e

80. The main signs indicating the phenomenon of hyperhydration in acute renal failure:

a.increase in sodium ions in blood plasma

b. decrease in sodium ions in blood plasma

c. an increase in potassium ions in blood plasma

d. decrease in potassium ions in blood plasma

5. decrease in calcium ions in blood plasma

81. The level of urea at which hemodialysis is performed:

a.10 mmol / l

b.15 mmol / l

c.18 mmol / l

d.21 mmol / l

e.24 mmol / l

82. At what rate does the GFR typically decline in males after the age of 45 years?

a. 0.1 ml/min/1.73 m<sup>2</sup>

b. 0.5 ml/min/1.73 m<sup>2</sup>

c. 0.8 ml/min/1.73 m<sup>2</sup>

d. 1.2 ml/min/1.73 m<sup>2</sup>

e. 2 ml/min/1.73 m<sup>2</sup>



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83. Which of the following does not form part of the glomerular filtration barrier?
- Endothelial cell fenestration
  - Sub-endothelial space
  - Glomerular basement membrane
  - Podocyte foot process slit diaphragm
  - Sub-podocyte space
84. Which of the following cell types does not perform a phagocytic function?
- Glomerular endothelial cell
  - Mesangial cell
  - Macrophage
  - Podocyte
  - Proximal tubular epithelial cell
85. Which of the following statements about angiotensin II is false?
- It causes vasoconstriction of the efferent arteriole
  - It increases the amount of albumin filtered by the glomeruli
  - It is increased in renal acidosis
  - It increases aldosterone production
  - It is reduced in people with diabetes
86. Which of the following does not affect the serum creatinine concentration in chronic kidney disease?
- Glomerular filtration rate
  - Tubular secretory function
  - Fluid overload
  - Skeletal muscle mass
  - Ethnic origin
87. Which of the following is not required to estimate GFR using the MDRD equation?
- Age
  - Sex



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c. Race

d. Creatinine

e. Body weight

88. In which of the following circumstances is the urea-to-creatinine ratio most likely to increase?

a. A malnourished patient with small muscle mass

b. A bodybuilder taking protein supplements

c. High blood pressure treated with vasodilator drugs

d. When the rate of flow of filtrate along the nephron is slowed

e. Trimethoprim therapy

89. At a routine checkup, a 42-year-old male with diabetes is found to have an eGFR of 32 ml/min/1.73 m<sup>2</sup>. When repeated 3 months later, it is 35 ml/min/1.73 m<sup>2</sup>. His albumin:creatinine ratio (ACR) is 35 mg/mmol (310 mg/g). Macroalbuminuria is defined as ACR >30 mg/mmol (>300 mg/g). What stage of CKD does he have?

a. Stage G4A2

b. Stage G2A1

c. Stage G4A3

d. Stage G3A3

e. Stage G3A2

90. Which of the following is not a typical symptom of kidney failure?

a. Insomnia

b. Hallucinations

c. Itching

d. Restless legs

e. Nausea

91. Which of the following statements about erythropoietin production in an adult is true?



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- a. It is divided between the liver and the kidneys
  - b. It is inhibited by NSAIDs
  - c. It is stimulated by muscle hypoxia
  - d. It is located in the interstitial cells
  - e. It is down-regulated in chronic kidney disease
92. Which of the following statements about parathyroid hormone synthesis is true?
- a. It is stimulated by hypocalcaemia
  - b) It is stimulated by activated vitamin D3
  - c) It is inhibited by hyperphosphataemia
  - d) It is stimulated by FGF-23
  - e) It is autonomous in secondary hyperparathyroidism
93. Which of the following statements about hypercalcaemia is false?
- a) It reduces GFR due to vasoconstriction
  - b) It impairs urinary concentration
  - c) It can be caused by loop diuretics
  - d) It is associated with raised alkaline phosphatase with metastatic carcinoma
  - e) It is associated with normal alkaline phosphatase in multiple myeloma
94. Which of the following is the modality of choice for detecting renal stones?
- a) Ultrasound
  - b) Doppler ultrasound
  - c) Isotope renography
  - d) CT scanning
  - e) MRI scanning
95. Which of the following statements about kidney biopsy is true?
- a) It is usually required to confirm a diagnosis of diabetic nephropathy
  - b) It causes bleeding in a minority of patients
  - c) It is essential to diagnose anti-glomerular basement membrane disease



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- d) It requires a general anaesthetic
- e) It should only be performed if it will change patient management
96. When should a patient be transferred to the multidisciplinary team to prepare them for dialysis?
- When the eGFR goes below 20 ml/min/1.73 m<sup>2</sup>
  - When the patient develops symptoms of uraemia
  - When the eGFR goes below 10 ml/min/1.73 m<sup>2</sup>
  - When the rate of decline in eGFR is greater than 10 ml/min/1.73 m<sup>2</sup>/year
  - When dialysis is likely to be needed within the next 12 months
97. What is the main etiological factor of acute glomerulonephritis:
- staphylococcus aureus
  - klebsiella
  - β-hemolytic streptococcus group A
  - Pseudomonas aeruginosa
  - pneumococcus
98. How long after the infection does acute glomerulonephritis develop?
- 10-12 days
  - 3-4 days
  - 7 days
  - 30 days
  - 2 months
99. Which of the following factors cause the development of acute glomerulonephritis? a) whey; b) vaccine; c) insect poison; d) medicinal substances; e) food products. Choose the correct combination of answers:
- a, b
  - a, b, e
  - a, d



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d. all answers are correct

100. Which age group is most susceptible to acute glomerulonephritis?

- a. up to 2 years old
- b. from 2 years of age to 40 years
- c. menopause
- d. the period of menopause
- e. puberty

### **Control questions for the course:**

1. Acute glomerulonephritis (AGN). Definition. Etiology.

Classification. The main links of pathogenesis. Clinical picture  
various forms of AGN.

2. Laboratory, instrumental criteria for the diagnosis of acute  
glomerulonephritis. The principles of therapy.

3. Chronic glomerulonephritis: definition, predisposing  
factors, classification, etiopathogenesis.

4. Chronic glomerulonephritis (CGN), latent form, clinical  
picture, diagnostic criteria, laboratory instrumental  
diagnostics. The principles of therapy.

5. Chronic glomerulonephritis (CGN), hypertensive form,  
clinical picture, diagnostic criteria, laboratory  
instrumental diagnostics. The principles of therapy.

6. Chronic glomerulonephritis (CGN), nephrotic form,  
clinical picture, diagnostic criteria, laboratory  
instrumental diagnostics. Principles of therapy

7. Chronic glomerulonephritis (CGN), mixed form, clinical  
picture, diagnostic criteria, laboratory instrumental  
diagnostics. The principles of therapy.



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8. Chronic glomerulonephritis (CGN), hematuric form, clinical picture, diagnostic criteria, laboratory instrumental diagnostics. The principles of therapy.
9. Classification and morphological manifestations of glomerulopathies.
10. Morphological manifestations of tubulopathies.
11. Morphology of nephrosclerosis and chronic renal failure.
12. Indicators: daily proteinuria, microalbuminuria, macrohematuria, microhematuria, albumin / creatinine in urine, protein / creatinine in the urine.
13. Glomerulonephritis: definition, predisposing factors, classification of the main links of pathogenesis.
14. Clinical, laboratory, instrumental diagnostic criteria glomerulonephritis, principles of therapy.
15. Criteria for diagnosis, tactics of therapy of rapidly progressing glomerulonephritis.
16. Clinical manifestations, diagnosis of nephritic syndrome (poststreptococcal).
17. Clinical manifestations, classification, diagnosis of nephrotic syndrome; the concept of congenital, infantile type of nephrotic syndrome.
18. Definition of the concept of steroid sensitivity, steroid resistance, steroid addiction.
19. Evaluation of renal function (calculation by the Schwartz formula).
20. Treatment and dispensary observation of nephritic syndrome.
21. Treatment, dispensary observation of debut, recurrence of nephrotic syndrome; steroid-dependent and steroid-resistant nephrotic syndrome.



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22. Pyelonephritis: definition, predisposing factors, classification of the main links of pathogenesis.
23. Clinical, laboratory, instrumental diagnostic criteria acute and chronic pyelonephritis, principles of therapy.
24. Criteria for the diagnosis of acute kidney injury according to AKIN.
25. Criteria for diagnosing AKI severity and outcomes according to pRIFLE.
26. Indications and contraindications for acute hemodialysis.
27. Renal replacement therapy in CKD V.
28. Bacteriological examination of urine: dip-slide method, collection medium portion of urine, bladder catheterization, urinary puncture bubble. Collection principles and methods, interpretation of the results of each method.
29. Determination of infection of the upper urinary tract.
30. Determination of complicated and uncomplicated variants of infection urinary tract.
31. Determination of the severity of urinary tract infection.
32. Principles of therapy for urinary tract infections.
33. Diagnostic criteria and principles of treatment of acute tubulointerstitial nephritis.
34. Diagnostic criteria and principles of treatment of chronic tubulointerstitial nephritis.
35. Renal amyloidosis: definition, predisposing factors, classification of the main links of pathogenesis.
36. Clinical, laboratory, instrumental diagnostic criteria amyloidosis of the kidneys, principles of therapy.
37. Clinical anatomy and physiology of the genitourinary organs.
38. Anuria. Classification, differential diagnostics. Sharp

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retention of urine.

39. Diet therapy. Sanatorium treatment of nephrological patients.

40. Acute pyelonephritis. Etiology, pathogenesis, classification, clinic, diagnostics, treatment.

41. Chronic pyelonephritis. Etiology, pathogenesis, classification, clinic, diagnostics, treatment.

42. Kidney transplantation. History. Indications and contraindications.

Immunological bases of donor selection. Waiting list.

Cadaveric kidney transplant and living donor transplant,

Advantages and disadvantages.

43. Management of patients after allotransplantation. Modern schemes immunosuppression. Preparations. Pharmacokinetics and pharmacodynamics.

Monitoring the effectiveness of immunosuppression. Complications.

Prevention of complications.

44. Tuberculosis of the kidneys, ureters, bladder. Definition.

Epidemiology. Pathogenesis. Classification. Clinical manifestations.

Differential diagnosis. Laboratory diagnostic methods.

Treatment (medication, surgical). Complications. Prevention.

45. Kidney damage in infectious diseases. Definition.

Epidemiology. Pathogenesis. Clinical manifestations. Treatment.

46. Urolithiasis. Prevalence and epidemiology.

Definition. Classifications. Etiology and pathogenesis. Clinical manifestations. Major complications. Differentiation flax diagnostics urolithiasis. Laboratory diagnostic methods.

Instrumental diagnostic methods.

47. Rheumatic diseases with kidney damage. Definition.

Variants of secondary nephropathies. Etiopathogenesis. Pathomorphology

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changes in the kidneys. Clinical manifestations. Diagnostics. Treatment.

48. Nephrogenic anemia. Pathogenesis. Diagnostics, control, treatment.

Iron preparations, erythropoietin preparations.

49. Alport syndrome. History. Prevalence. Age

Aspects. Inheritance types, classification. Etiopathogenesis. Clinic.

Diagnostics. Forecast. Treatment.

50. Indications and contraindications for nephrobiopsy. Possible complications. Bleeding. Methods of prevention and treatment.

Indications and contraindications for nephrobiopsy in special categories patients (diabetes mellitus, the elderly, patients with significant impaired renal function, systemic vasculitis).

## **Problems for the course:**

### **Problem №1**

Patient R., 30 years old, was admitted to the nephrology department with a diagnosis of exacerbation of chronic pyelonephritis.

Complaints about fever, pulling pain in the lumbar region, frequent and painful urination, general weakness, headache, lack of appetite. Deterioration is associated with hypothermia. Due to the deterioration of his condition, she called an ambulance and was hospitalized in a hospital. The patient has a history of chronic bilateral pyelonephritis for 6 years.

On examination, the nurse revealed: temperature 38.7<sup>0</sup>C, pulse 98 per minute, blood pressure is 100 and 60 mm. Hg., respiratory rate 24 per minute, skin dry, pale, pasty legs, positive Pasternatsky's symptom on both sides.

The patient is restless, worried about her condition, doubts the success of the treatment. Worries about children, sick mother, with whom she lives together in a one-room comfortable apartment. Afraid of losing her job as a cook in a private enterprise.

### Tasks

1. Identify the violated needs
2. Identify the patient's problems.
3. Formulate goals and plan for nursing interventions for the priority issue.



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## Problem № 2

A 54-year-old patient was admitted to the nephrology department with a diagnosis of chronic pyelonephritis.

Complains of dull pain in the lumbar region, painful and frequent urination, headache, general weakness, poor appetite, restless sleep. Sometimes she does not hold urine during exertion (coughing and other efforts), recently she has noted an urgent urge to urinate (she can take 10-20 steps after the urge appears, “does not have time to run to the toilet”). Because of this, she is very depressed, upset.

Consciousness is clear, the position in bed is active. The skin is pale, clean, respiratory rate- 20 per minute, Ps - 92 beats per minute, satisfactory qualities, blood pressure - 140/90 mm Hg., body temperature is 37.6°C.

Tasks

1. Identify the patient's problems.
2. Formulate goals and plan for priority nursing care with motivation for each nursing intervention.

## Problem № 3

A 36-year-old patient is in the nephrology department with a diagnosis of chronic renal failure.

Complains of severe weakness, fatigue, thirst and dry mouth, nausea, intermittent vomiting, loss of appetite, poor sleep. Poorly tolerates fluid restriction, often cannot resist and drinks water in the ward from the tap. She asks all the time why she is not getting better.

Consciousness is clear, the position in bed is active. Pale skin, puffy face, slight swelling in the feet and legs. Height 166 cm, weight 58 kg. Respiration rate 24 per minute, pulse 96 beats per minute, rhythmic, BP -150/90 mm Hg.

The doctor appointed bed rest.

Tasks

1. Identify the patient's problems.
2. Formulate goals and plan for priority nursing care with motivation for each nursing intervention.

## Problem № 4

A 45-year-old patient is in the nephrology department with a diagnosis of chronic glomerulonephritis.

Complains of general weakness, shortness of breath, headache, nausea, edema, decreased appetite, poor sleep.



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The condition is serious. Sits in bed on pillows, almost motionless. Pale skin, acrocyanosis, puffy face, swelling in the legs, lower back, NPV 32 per minute, Ps -92 beats per minute, rhythmic, tense, BP – 170/100 mm Hg. The abdomen is enlarged due to pronounced ascites.

The doctor appointed bed rest.

Tasks

1. Identify the patient's problems.
2. Formulate goals and plan for priority nursing care with motivation for each nursing intervention.

### **Problem № 5**

A nearby nurse was invited to visit a patient with urolithiasis.

A 42-year-old patient ate a large portion of fried meat at dinner in the evening. At night, he developed sharp pains in the lumbar region with irradiation to the groin area, frequent painful urination.

Objectively: the behavior is restless, rushes about, groans. The skin is of normal color, wet, respiratory rate-22 per minute, pulse 100 per minute, the abdomen is swollen, soft, moderately painful on palpation, Pasternatsky's symptom is sharply positive on the right.

Tasks

1. Determine and justify the patient's condition.
2. Make an algorithm of nurse actions

### **Problem № 6**

The nurse came to see patient K.

22 years old with a diagnosis of acute diffuse glomerulonephritis (the patient categorically refused the proposed hospitalization).

According to relatives, over the past hours, the condition has deteriorated sharply, headaches intensified, vomiting was 2 times, practically did not urinate.

Objectively: the condition is serious, it is difficult to answer questions. The face is pale, pasty. Pulse 56 / min., BP 180/100 mm Hg. During the examination, the condition worsened, an attack of convulsions arose, which lasted about 2 minutes, after which the patient was inhibited, lethargic.

Tasks

1. Determine and justify the patient's condition.
2. Make an algorithm of nurse actions.

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#### 1.4.4. Course policy and assessment criteria

### Methodological materials defining procedures for assessing knowledge, abilities, skills and (or) experience

#### Current control and test-examination session.

The rating system has the following goals:

- a. activating the systematic work of students, developing students' skills of individual work; fostering responsibility for the quality of one's own training;
- b. enhancing the work of teachers to improve the methods of teaching students;
- c. developing a genuine partnership between teacher and student;
- d. obtaining an accurate and objective assessment of the level of knowledge, abilities and skills in the professional training of students.

1.2. The rating system for assessing students' knowledge in the course of all forms of control is carried out on a 100 point scale.

1.3. Module is the unit to be assessed within each discipline.

- A student's rating is defined as the average number of points per semester, academic year, период обучения. The rating is calculated by the dean's office with an accuracy of two decimal places and serves to assess the academic work of students and rank them in the group, flow, course.

- The formula for the overall student rating is as follows:

$$R = \frac{\sum R_i}{n}$$

where  $R_i$  – rating for each discipline,  $n$ - the number of disciplines per semester, academic year, for the entire period of study.

- The final rating for the discipline is calculated as the arithmetic mean of the total score for the discipline and the marks for the final control (exam / test). The final rating is entered in the statement and record book.

- The total score for the discipline is calculated by the formula:

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$$E = \frac{B_1 + B_2 + \dots + B_n}{n}$$

where  $B$  – total point per unit,  $n$  – unit quantity in discipline.

- Each module is evaluated on a 100 point system. Maximum point - 100, from them:
  - a. attendance – 20 points
  - b. current academic performance – 40 points (20 points – for classroom works, 20 points- for individual works)
  - c. checkpoint (final assessment of knowledge per unit) - 40 points
- The final control (exam / test) in the discipline is estimated at a maximum of 100 points.
- Before passing the checkpoint for each unit, the student has the opportunity to attend a teacher's consultation. The consultation is carried out strictly on the day of the teacher's duty.
- The retake of the checkpoint is provided only in case of a valid reason, which is determined by the dean's office. The deadline is no later than 1 week after the checkpoint date.
- The student is allowed to pass the next module, regardless of the results of the previous unit.
- A student with 40% or more absences in the humanities and natural sciences and 30% or more absences in general professional and special disciplines without a valid reason is not allowed to take the final control of the discipline (test, exam).
- A student is allowed to pass the final control (exam / test) if he has a total score in the discipline of 36 or more points.
- A student has not mastered the discipline if his total score / rating for the discipline is less than 36 points.



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- A student is automatically exempted from passing the exam if his total score in the discipline is 90-100 (excellent).

- A student is exempt from passing the test if his total score in the discipline is 60 - 100 (satisfactory, good, excellent)

- The decision to dismiss a student is made by the instructor based on the student's current progress.

**Description of indicators and criteria for assessing competencies at various stages of their formation, description of assessment scales. Calculation of a student's rating score**

1. The attendance coefficient is calculated based on the formula:

$$k = \frac{20}{n}$$

where  $n$  = total number of classes (lectures and practical) in the given unit. For each attended class student gets  $k$  points; за пропущенное занятие – 0 баллов.

2. The teacher has the right to reduce the amount of points by 1/2 of the total score for attendance due to student late arrivals.

3. The current and final progress of the student is assessed by the teacher based on the knowledge, skills and abilities shown by this student.

4. To assess the student's progress, the teacher can use the scale correspondence of grades and points.

**Scale of correspondence of grades and points**

Maximum points	Intervals			
	«unsatisfactory»	«satisfactory»	«good»	«excellent»
20	0-11	12-15	16-17	18-20
40	0-23	24-30	31-35	36-40

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60	0-35	36-45	46-53	54-60
100	0-59	60-75	76-89	90-100

### Discipline Policy

The policy of the discipline lies in the consistent and purposeful implementation of the educational process. Teachers' requirements for students are based on general teaching principles in ISM IUK.

1. Obligatory, regular attendance of lectures, practical classes.
2. Mandatory attendance at lectures. For one missed lesson, 2 points are deducted when calculating ratings.
3. Mandatory implementation of the SIW in various forms.
4. Delivery of the SIW assignments at the appointed time according to the thematic plan no later than the week corresponding to this section.
5. Passing midterm control according to the thematic plan.
6. Active participation in the educational process (synopsis of laboratory work, preparation of theoretical material, exercise, solving situational problems and tests, laboratory work under the guidance of a teacher and a teacher's assistant).
7. Working off missed classes is possible only with the permission of the dean's office indicating the exact number of classes.
8. Don't be late for class.
9. The presence of a clean, ironed, white robe.
10. Respectful attitude to the teaching staff, teaching and support staff and students.
11. Respect for the property of the department: furniture, appliances, flowers, chemical dishes, etc.

### Assessment Criteria:

**The mark "Excellent"** is given if the student 1) fully sets out the studied material, gives the correct definition of linguistic concepts; 2) reveals an understanding of the material, can substantiate their judgments, apply knowledge in practice, give the necessary examples not only from the textbook, but also independently; 3) presents the material consistently and correctly from the point of view of the rules of the Russian language.



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**The mark "Good"** is given if the student gives an answer that meets the same requirements as for the mark "excellent", but 1-2 mistakes are allowed, which he corrects himself, and 1-2 shortcomings in the sequence and language design.

**The grade "Satisfactory"** is given if the student discovers knowledge and understanding of the main provisions of the given topic, but: 1) expresses the material incompletely and makes inaccuracies in the definition of concepts or formulation of the rules; 2) does not know how to substantiate his judgments deeply and convincingly and give examples; 3) presents the material inconsistently and makes mistakes in the language of the presentation.

**The grade "Unsatisfactory"** is given if a student reveals ignorance of most of the relevant section of the studied material, makes mistakes in the formulation of definitions and rules that distort their meaning, and presents the material in a disorderly and uncertain way. The mark "unsatisfactory" marks such shortcomings in the preparation of the student, which are a serious obstacle to the successful mastering of the subsequent material.

**Oral questioning is rated on a 40-point scale:**

№	points	Knowledge, skills, competencies	Rating
1	0	No answer or refusal to answer	0
2	1-9	Recognition of the object of study, recognition of certain known terms and facts; the manifestation of the desire to overcome learning difficulties; manifestation of situational interest in the teaching and the subject	Low (receptive)
3	10-12	Recognition of the object of study, differentiation of definitions, structural elements of knowledge, manifestation of volitional efforts and motivation for learning	Low (receptive)
4	13-16	Incomplete reproduction of programmatic educational material at the memory level; the presence of significant errors that can be eliminated with the help of a teacher; difficulty in using special, general educational and intellectual skills; striving to overcome difficulties; situational manifestation of responsibility, self-criticism.	Satisfactory (receptive-productive)



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5.	17-19	Mastering educational material at the reproductive level and incomplete reproduction; the presence of correctable errors with additional (leading) questions; difficulties in the use of certain special, general educational and intellectual skills or certain skills; manifestation of volitional efforts, interest in learning, adequate self-esteem, independence, meaningfulness of actions, etc.	Satisfactory (receptive-productive)
6.	20-23	Conscious reproduction of programmatic educational material, including those of varying degrees of complexity, with insignificant errors; difficulties in the use of certain special, general educational and intellectual abilities and skills; interest in learning and achieving results.	Medium (reproductive-productive)
7.	24-28	Full reproduction of program material with insignificant errors; applying knowledge in a familiar situation according to a model; application of special, general educational and intellectual skills and abilities with little help from a teacher; persistence and desire to overcome difficulties; situational manifestation of the desire for creativity.	Medium (reproductive-productive)
8	28-30	Possession of program training material, including those of varying degrees of complexity, operating it in a familiar situation; the presence of single insignificant errors in actions; independent use of special, general educational and intellectual abilities and skills; manifestation of aspirations for the creative transfer of knowledge, organization, self-criticism, reflection, etc.	Sufficient (productive)

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9	31-34	Possession of program training material and operating it in familiar and unfamiliar situations; the presence of single insignificant errors in actions, independently corrected by the student; the presence of a certain experience of creative activity; manifestation of conscientiousness, responsibility, self-esteem, reflection, etc.	Sufficient (productive)
10	35-37	Free operation with program educational material of varying degrees of complexity in an unfamiliar situation; performing tasks of a creative nature; high level of independence and erudition.	Sufficient (productive)
11	38-40	Free operation of program educational material of varying degrees of complexity using information from other educational courses and disciplines; the ability to consciously and quickly transform the acquired knowledge to solve problems in non-standard situations; manifestation of purposefulness, responsibility, cognitive activity, creative attitude to learning.	High (productive creative)

#### **1.4.5. EDUCATIONAL – METHODOLOGICAL AND INFORMATIONAL SUPPORT OF THE DISCIPLINE**

##### **List of recommended literature:**

1. Diagnostic Atlas of Renal Pathology, Fogo, Agnes B 7th ED. Elsevier, 2005
2. Clinical Dialysis, Nissenson, Allen R, 4th ED. Mc Graw Hill, 2005
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## **JOURNALS**

### International

1. Transplantation



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2. Kidney International
3. Hemodialysis International
4. Clinical Journal of the American Society of Nephrology Indian
5. Indian Journal of Nephrology

### **Online Journals**

1. BMC Nephrology
2. Clinical and Experimental Nephrology
3. International Urology and Nephrology
4. Journal of Artificial Organs
5. Hong Kong Journal of Nephrology
6. Clinical Queries: Nephrology
7. Journal of American society of Hypertension
8. Journal of Cardiothoracic- Renal research
9. Indian Journal of Transplantation
10. Pediatric Nephrology

#### **1.4.6. Material and technical support of the discipline**

In accordance with the requirements of NCEI ESPC "IUK", the department has a specially equipped classroom for lectures on flows of students, premises for practical training for students of 30 people and an auxiliary room for storing chemical reagents and preventive maintenance of educational and scientific equipment.

The room for lectures is equipped with a power supply set for floor switchboards (220 V, 2 kW, complete with an RCD), specialized furniture and organizational tools (classroom board for writing with chalk and felt-tip pen, stand-lectern, lecturer's table, chair, classroom tables, classroom chair, as well as technical training aids (wall screen with electric drive and remote control, multimedia projector with a laptop).

№	<i>Material and technical equipment</i>
1.	Theoretical and practical study of the Nephrology program is carried out at the Department of Therapy

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2.	Technical equipment: 2 laptops, 2 multimedia projectors.
3.	Visual aids: educational stands, educational tables, educational histories of disease.
4.	Presentations of lectures on all topics of the lecture course

During the pandemic, all clinical sessions were conducted remotely: on the basis of electronic platforms: whats app, ZOOM, youtube and test.edu.kg. using visual aids of ISM.

Clinical skills were practiced at the place of residence in the relevant clinics at the place of residence.

#### **1.4.7. Student's research work**

Research work includes preparing students through their mastering in the learning process the methods, techniques and skills of performing research work, developing their creative abilities, independence, initiative in learning and future professional activity within the specialty.

The program of students' research work (SRW), as a section of the development of practical skills, includes:

- study of special literature and other scientific and medical information, achievements of domestic and foreign science and technology in the field of medical knowledge, preparation of scientific abstracts (literature reviews);
- participation in scientific research or in the implementation of certain developments at the theoretical or clinical departments of ISM;
- the implementation of the collection, processing, analysis and systematization of scientific information on a topic or on an assignment;
- preparation of reports and presentation of a report at the conference, preparation of scientific work for publication;
- participation in mass events of the SRW system (student scientific conferences, seminars, subject Olympiads, competitions, "Week of Science", exhibitions, discussions, disputes, etc.).

## **2. Teaching materials**

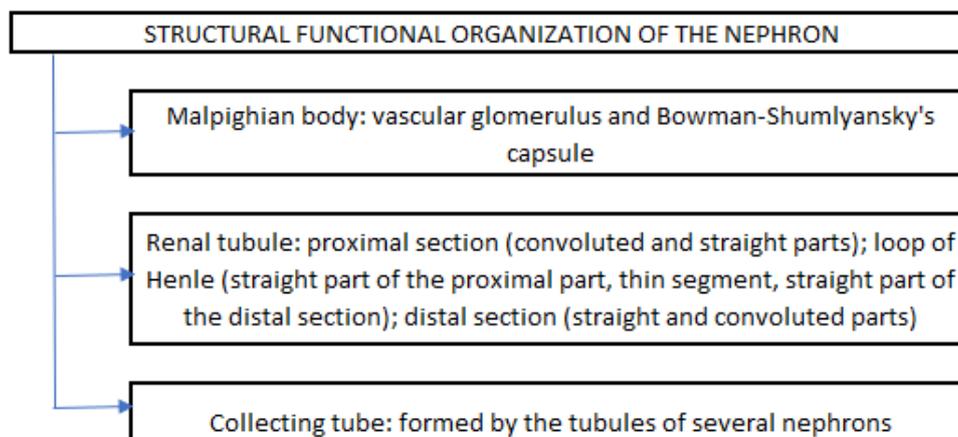
### **2.1. Lecture notes**

**1. Introduction to Nephrology. Anatomy and physiology of the kidney. Methods of examination of a nephrological patient. Major syndromes in nephrology**



**Nephrology** (from ancient Greek. νεφρός - "kidney", and λόγος - "teaching") is a field of medicine that studies the functions and diseases of the kidneys. At the other extreme of the differential diagnosis is nephrosurgery and urology.

**The nephron** is a structural unit of the kidney where blood is filtered and urine is produced.



## GENERAL EXAMINATION

The number of complaints that a patient presents with diseases of the urinary system can be enormous.

- Pain.
- Disorders of urination. Oligacuria is an abnormally rare urination due to a violation of the innervation of the bladder at the level of the spinal cord. Nocturia is the predominance of the volume of nocturnal urine output and the amount of urination at night over the daytime. Stranguria - difficulty, frequent and painful urination. Typical for cystitis, prostatitis. Urinary incontinence is an involuntary discharge of urine without a prior urge to urinate. Urinary incontinence is the inability to retain urine as a result of urgency. It is observed in acute cystitis, bladder tumor, prostate adenoma. Dysuria is painful urination. Enuresis is bedwetting. It occurs as a manifestation of neurosis, with intoxication and infections. Difficulty urinating is when the stream of urine becomes sluggish, thin, directed vertically downward, or urine is released drop by drop. Retention of urine (ischuria). Urinary retention is the absence of urine flow



from the bladder. Unlike anuria, the process of urination and the flow of urine into the bladder is not disturbed.

- Changes in urine. The patient may present complaints that are associated with a change
- Swelling. The patient may complain about the appearance of edema on the face, lower extremities, arms, an increase in the size of the abdomen, genitals.
- Increased blood pressure. Patients with high blood pressure complain of transient nausea, sometimes vomiting, tinnitus, flashing of flies before the eyes, heaviness in the head and headache, more often in the 13th occipital region, sometimes in other areas of the head or diffuse.
- Polydipsia

## 2. GLOMERULONEPHRITIS

Glomerulonephritis (GN) is an immune-inflammatory diffuse kidney disease with primary and initial damage to the glomeruli.

Etiological factors of GN can be divided into two groups:

### 1. infectious:

- $\beta$  - hemolytic streptococcus,
- staphylococcus and other bacteria,
- viruses, incl. hepatitis B and C viruses, cytomegalovirus, HIV, etc.
- protozoa;

### 2. non-infectious:

- medicines,
- drugs,
- food and household allergens, alcohol, tumors, etc.

The main clinical symptoms of GN are related to the so-called "Classical triad of nephritis":

1. urinary syndrome,
2. edema,
3. arterial hypertension.

Urinary syndrome is represented by insignificant (less than 1 g / day), moderate (1 - 3 g / day), severe or massive (more than 3 g / day) proteinuria and macro- or microhematuria,



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as well as cylindruria. Urinary syndrome is permanent; during the period of relative remission, glomerulonephritis only decreases.

Edema in acute GN is often nephritic in nature and are associated with a decrease in water filtration through the glomerular filter. In most cases of chronic GN, edema is a manifestation of nephrotic syndrome, the symptoms of which are massive proteinuria, hypoproteinemia, hypoalbuminemia, hypercholesterolemia.

The following factors are involved in the pathogenesis of arterial hypertension: sodium and water retention, activation of the RAAS, activation of the sympatho-adrenal system, and a decrease in the depressive function of the kidneys. Arterial hypertension is often difficult to correct, requiring multicomponent therapy, and is often characterized by increased diastolic blood pressure. By pathogenesis and distinguished by acute, chronic and rapidly progressive (malignant) glomerulonephritis course.

Acute GN usually occurs 7 to 28 days (usually 10 to 14 days) after an infection. Characterized by acute nephritic syndrome (urinary syndrome + arterial hypertension + nephritic edema), but there may also be a latent course, manifested only by isolated urinary syndrome.

Rapidly progressive (malignant) GN is characterized by the severity of clinical symptoms, steady progression, and the onset of renal failure 3 to 6 weeks after the onset of the disease.

Chronic GN, according to the classification of E.M. Tareeva (1958), is subdivided into: • latent, characterized by isolated urinary syndrome. As a special form, hematuric nephritis stands out (hematuria prevails, proteinuria is insignificant), • hypertensive, characterized by constant arterial hypertension in combination with mild urinary syndrome, • nephrotic, characterized by nephrotic syndrome, • mixed, characterized by a combination of nephrotic syndrome and arterial hypertension.

Morphological classification of chronic glomerulonephritis:

1. Nephritis with minimal changes (lipoid nephrosis, MC). With light microscopy, there are no changes in the kidneys; electron microscopy reveals the fusion of the legs of the podocytes.
2. Membranous nephritis (MN) is characterized by a thickening of the basement membrane of the glomeruli without signs of cell proliferation.
3. Mesangial proliferative glomerulonephritis (MPGN) is characterized by proliferation of mesangial cells, expansion of the mesangium. Electronic and immunofluorescence



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microscopy reveals in the mesangium immune complexes containing Ig A, much less often Ig M and Ig G.

4. Mesangiocapillary (membranoproliferative) GN (MGGN) is characterized by thickening, changes in the basement membrane with proliferation of mesangial cells.

5. Focal - segmental glomerulosclerosis (FSGS) is characterized by segmental sclerosis in the glomerulus, unchanged basement membranes and lack of proliferation.

6. Fibroplastic GN is isolated as a single final of all the above morphological variants.

#### Treatment.

Indications for hospitalization are acute GN, exacerbation of chronic GN, rapidly progressive GN.

Dietary recommendations depend on the clinical symptoms of glomerulonephritis. With arterial hypertension and edema, it is necessary to limit salt and fluid. When establishing the cause of acute glomerulonephritis, exacerbation of chronic glomerulonephritis, etiological treatment is necessary. Antibiotics are prescribed for post-streptococcal nephritis, nephritis as part of infective endocarditis, etc. With paraneoplastic GN, it is possible to achieve remission after radical removal of the tumor. The etiological types of treatment also include the abolition of a drug - an antigen, the elimination of a household or food allergen, abstinence in case of an alcoholic etiology of the disease.

Pathogenetic treatment of glomerulonephritis should include an effect on both the immune and non-immune mechanisms of the development and progression of the disease. In order to influence the immune mechanisms of pathogenesis, immunosuppressants are used:

Glucocorticosteroids reduce the loss of inflammatory and immune cells in the focus of inflammation, suppress the production of many inflammatory mediators. Usually, prednisolone is administered orally at a dose of 1 to 1.5 mg / kg / day for 1 to 2 months, followed by rapid withdrawal in the absence of effect or a slow decrease to a maintenance dose (usually 15 to 20 mg per day). With high disease activity (rapidly progressing GN, severe nephrotic syndrome, etc.), ultra-high doses of methylprednisolone can be used: 1 g intravenous drip daily or every other day until a total dose of 3-4 g is reached.

Cytostatic drugs:

- cyclophosphamide (cyclophosphamide)

Course of medication is not less than 6 g for 6 months or more.

- azathioprine - cytostatic - The usual dose of azathioprine (imuran) is 1-3 mg / kg / day.

### 3. PYELONEPHRITIS



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The term "pyelonephritis" denotes a nonspecific infectious and inflammatory process that occurs mainly in the renal pelvis and its tubulointerstitial zone.

The main route of infection of the urinary tract and kidneys is ascending, urinogenic; their hematogenous infection occurs only in 3-5% of cases, as a rule, in the course of systemic infectious processes occurring with bacteremia.

Factors predisposing to the formation of an infectious process in the urinary tract and kidneys are:

- obstruction of the urinary tract, leading to the appearance of residual urine in the bladder and, consequently, to the facilitation of its infection due to a decrease in the production of protective factors of the mucous membrane of the latter stretched with reduced blood flow;
- instrumental studies of the urinary tract, contributing to their direct infection;
- pregnancy due to indirect (hyperestrogenemia and disorders of the cystoid function of the ureters) and direct (enlarged uterus) effects on the urinary tract, leading to impaired urinary outflow;
- diabetes mellitus, accompanied by impaired renal blood flow (PK), progressive glomerulosclerosis, neurogenic dysfunction of the bladder and, probably, immune failure due to glycosylation of proteins involved in the immune process;
- non-infectious kidney pathology (GN, IN, etc.), which also causes impaired renal blood flow, glomerulo- and tubulointerstitial sclerosis;
- immunosuppressive therapy and associated changes in immunity and nonspecific factors of protection of the urinary tract and the body as a whole.

Acute pyelonephritis. Most often, acute occlusion of the urinary tract leads to the development of acute pyelonephritis, in a number of patients it develops after diagnostic and therapeutic manipulations on the urinary tract or as a result of systemic infections.

For the typical course of acute pyelonephritis, a triad of syndromes is characteristic: intoxication, pain and urinary. In about 80% of cases, the onset of acute pyelonephritis is characterized by a sharp and significant increase in body temperature (up to 39-40° C, sometimes higher), tremendous chills, sweat, arthralgia, myalgia, a rapid increase in symptoms of general intoxication - weakness, lethargy, weakness, nausea, vomiting, i.e. signs of a severe infectious disease. Fever is usually remitting, sometimes persistent, and may be accompanied by a herpes simplex rash.

Complications of acute pyelonephritis:

- shock
- toxic hepatitis



- purulent paranephritis
- ARF
- urosepsis.

Early laboratory symptoms of acute pyelonephritis are bacteriuria and leukocyturia, although they may not be present with ureteral occlusion on the affected nephritis side. Chronic pyelonephritis is most often the result of an acute process. The mechanisms of chronicity remain largely unclear, the state of the macroorganism, the characteristics of the infection, the adequacy of therapy, and many other factors, including "the impossibility of completing acute inflammation with regeneration", matter. Chronic pyelonephritis without exacerbation proceeds with very little symptoms. Only a targeted questioning of patients helps to identify symptoms such as pain in the lumbar region, episodes of seemingly unmotivated low-grade fever, chilling, urinary disorders (polyuria or nocturia) and urination (dysuria, pollakiuria). The manifestations of infectious asthenia are common - fatigue, a feeling of weakness, decreased performance, although these symptoms are so common that they are rarely already associated by doctors with any particular nosological form.

#### Treatment

##### ARF treatment tactics:

- elimination of the disturbed passage of urine
- antibiotic therapy (empiric or etiotropic)
- correction of impaired coagulation
- symptomatic therapy
- prevention of exacerbation

The approaches to the treatment of patients with acute and chronic pyelonephritis have their own characteristics.

Treatment of acute pyelonephritis, with the exception of cases of mild course (subfebrile condition, absence of signs of intoxication, prevalence of symptoms of cystitis and pyelitis over symptoms of parenchymal renal process), should be carried out in stationary conditions due to the need for parenteral antibacterial and detoxification therapy, and in cases of urinary tract obstruction - due to the need to restore the passage of urine using ureteral catheterization or nephrostomy. Indications for hospitalization of patients with acute pyelonephritis:

- intoxication with repeated vomiting
- an increase in UTI symptoms
- the assumption of sepsis



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- unclear diagnosis
- signs of urinary tract obstruction

Relative indications for hospitalization:

- age > 60 years
- anomaly of the urinary tract
- immunosuppressive conditions (diabetes mellitus, patients with a kidney transplant, sickle cell anemia)
- impossibility of monitoring the patient
- socially unadapted patients.

#### **4. KIDNEY AMYLOIDOSIS**

Amyloidosis is a group of diseases characterized by the deposition in the extracellular matrix of various organs and tissues of low molecular weight insoluble proteins with  $\beta$  - fibrillar structure and giving a specific color with Congo red.

The diagnosis of amyloidosis is mainly morphological. The methods of morphological diagnostics are as follows:

- coloring Congo red with further study in polarized light,
- staining with thioflavin T,
- typing of amyloid using painting methods (alkaline guanidine),
- immunoperoxidase reaction with a panel of antisera to basic amyloid proteins.

The classification of amyloidosis is based on the morphological type of amyloid.

AA - amyloidosis (secondary)

Main causes: rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, tumors, incl. hemoblastosis, ulcerative colitis and Crohn's disease, purulent destructive processes (osteomyelitis, bronchiectasis, tuberculosis, etc.).

The precursor - protein of amyloid is an acute phase plasma protein -SAA. AA - amyloidosis - a systemic disease. The organs most frequently affected by AA amyloidosis are the kidneys, liver, spleen, and intestines.

The clinical course of AA - renal amyloidosis has 3 stages: proteinuric, nephrotic, uremic. Urinary syndrome in amyloidosis is represented by proteinuria, urinary sediment changes little. Enlarged kidneys are determined by ultrasound. Arterial hypertension occurs in approximately 20-30% of patients, arterial hypotension is more often recorded, possibly associated with amyloid lesions of the adrenal glands.

Diagnosis of AA - amyloidosis suggests morphological confirmation of the clinical hypothesis. The most informative result is a kidney biopsy.



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Treatment of AA - amyloidosis is, first of all, the treatment of the underlying (causal) disease, suppression of the inflammatory process

AL - amyloidosis (primary).

Precursors of amyloid - light chains of monoclonal immunoglobulin, more often  $\lambda$ , less often  $\kappa$  - type (3: 1). An abnormal clone of plasma cells or B cells produces amyloidogenic immunoglobulins.

AL - amyloidosis - is also a systemic disease with the predominant and most frequent damage to the heart, gastrointestinal tract, and kidneys.

The initial symptoms are fatigue and weight loss. The disease is not recognized until signs of heart or kidney damage appear.

Amyloidosis of the heart is manifested by progressive congestive heart failure, rhythm and conduction disturbances, valve damage, and myocardial ischemia. Echocardiography reveals restrictive cardiomyopathy with diastolic dysfunction.

Renal amyloidosis is manifested by proteinuria, nephrotic syndrome, decreased renal function, often without arterial hypertension.

ATTR - amyloidosis. The precursor of amyloid is transthyretin (prealbumin), a transport protein for thyroxine and retinol, a binding protein synthesized in the liver. If there is a mutation of transthyretin (for example, (Val130  $\rightarrow$  Met), then familial hereditary amyloidosis develops. Its most frequent manifestations are symptoms of amyloid polyneuropathy. At the heart of amyloid in senile amyloidosis is normal unmutated transthyretin with a violation of the conformational relationships in the protein molecule. People over 70 suffers from senile amyloidosis. Clinical manifestations are similar to AL - amyloidosis, but less severity, often - a combination with atherosclerosis. Other variants of amyloidosis are rare. A combination of several variants of amyloidosis in one patient is possible.

## 5. TUBULO - INTERSTITIAL NEPHRITIS

Tubulo - interstitial nephritis (TIN), or a shorter name - interstitial nephritis (IN) - is an acute or chronic abacterial inflammation of the interstitial (interstitial) tissue of the kidneys and interstitium. This is a separate form of kidney disease. It is distinguished from glomerulonephritis by a primary tubulointerstitial lesion with secondary involvement of the glomeruli, from pyelonephritis by a diffuse nature and an abacterial nature. The concept of "tubulo interstitial nephropathy" includes not only inflammatory lesions of the kidneys, but also metabolic, toxic lesions without a clear inflammatory component.



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Distinguish acute and chronic IN. Acute IN is most often of drug etiology. In the pathogenesis of drug acute IN, the immunological concept is currently the most recognized. Evidence of this is the eosinophilia and allergic skin reactions observed in ¼ patients, as well as in some cases an increase in immunoglobulins M, G in the blood, an increase in the titer of complement, the detection of immunoglobulins in the interstitium and tubular membrane, etc. Any drugs, but more often antibiotics of the penicillin series, anti-tuberculosis drugs, nonsteroidal anti-inflammatory drugs (NSAIDs), sulfonamides, allopurinol, cimetidine, and even Tibetan and Chinese herbs can cause acute IN. Clinical manifestations: acute onset, fever (in the treatment of patients with high body temperature - a repeated wave of fever), eosinophilia, accelerated ESR, hyperproteinemia, hypergammaglobulinemia, skin rash, oliguria, but more often polyuria. Urinary syndrome is required and is represented by hematuria, proteinuria no more than 2 g per day. And quite often - acute kidney chronic insufficiency. Features of acute renal failure against the background of drug IN: azotemia is combined more often with moderate oliguria or polyuria, casuistry - anuria, hyperkalemia and severe arterial hypertension are rarely observed.

Chronic interstitial nephritis is a polymorphic disease associated with various etiological factors. The disease does not seem to have an allergic nature. More often there is a chronic toxic effect, repeated many times or acting constantly. The development of medicinal chronic IN is associated with long-term use of analgesics, NSAIDs, therapy with lithium, cisplatin, cyclosporine, etc. In contrast to acute IN, toxic effects are more important in pathogenesis than immune ones.

The clinical picture consists of the following symptoms: weakness, sometimes headache, moderate arterial hypertension, polyuria, thirst. Formation of nephrocalcinosis, nephrolithiasis is possible. A constantly reduced specific gravity of urine, hematuria, sometimes mild proteinuria, dyslectrolythemia, slowly increasing anemia, then the development of renal failure are determined in the laboratory. The impairment of the concentration function of the kidneys is several years ahead of the decrease in the nitrogen-excreting function. Renal failure progresses slowly, from the initial azotemia to the development of the terminal stage, sometimes it takes 5 to 10 years. Treatment of chronic IN consists in abolishing a toxic substance (medicine, chemical), prescribing large volumes of fluid (diuresis should be at least 2 liters per day), correcting identified violations of the electrolyte and acid-base balance, and controlling the possible addition of a urinary tract infection. The possibility of slowing the progression of nephrosclerosis using a low-protein diet, ACE inhibitors is discussed.



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## **6. Kidney damage in metabolic and systemic diseases**

### **DAMAGE OF THE KIDNEY IN ARTERIAL HYPERTENSION**

The relationship between hypertension and the kidneys is very complex. On the one hand, renal diseases and renal dysfunction can cause arterial hypertension. On the other hand, the kidneys are a target organ in hypertension.

What are the mechanisms of the effect of increased blood pressure on the kidneys? In a normal glomerulus, a certain, normal, pressure  $P$  acts, providing glomerular filtration. If for some reason the systemic blood pressure changes, the mechanism of autoregulation of renal blood flow enters the protection of the glomerulus. For example, with high systemic blood pressure, intraglomerular pressure will also increase. And hyperfiltration is a direct path to rapid sclerosis of the glomerulus, to its death. Specific mechanisms of this detrimental effect of excessive filtration and excessive glomerular function have been established. So, with preserved autoregulation, this does not happen. The afferent arteriole is very elastic, it allows only that volume of blood to the glomerulus, which is necessary for the renal blood flow to be stable and normal. But as a result of a prolonged course of hypertension with high blood pressure numbers, a breakdown of autoregulation is possible, and then systemic hypertension is transmitted to the glomerulus and nephrosclerosis is formed.

### **DIABETIC NEPHROPATHY**

Kidney damage in patients with diabetes mellitus (DM) can be a manifestation of macroangiopathy (nephroangiosclerosis), microangiopathy (diabetic nephropathy) and infectious complications of diabetes (pyelonephritis). The pathology with the worst prognosis is diabetic nephropathy (DN), which will be discussed in this chapter. Diabetic nephropathy develops in approximately 40% of patients with type 1 and 2 diabetes. In patients with type 1 diabetes, the first manifestations of DN are recorded after 5-10 years from the onset of diabetes. And in patients with type 2 diabetes, diabetic nephropathy is often diagnosed simultaneously with diabetes. Patients with end-stage DN make up at least a third of all patients with renal failure receiving renal replacement therapy in the United States and in European countries.

The clinical reflection of functional structural changes in the kidneys in diabetic nephropathy is microalbuminuria (stage 1 of DN), proteinuria, including with the formation of nephrotic syndrome (stage 2 of DN), renal failure (stage 3 of DN).



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Thus, the initial sign of DN is microalbuminuria (MAU). Recent studies have convincingly shown that prevention of further progression of nephropathy is most effective at the MAU stage. Therefore, the problem of diagnosing DN at the MAU stage is so urgent and important. It is recommended to conduct a urine test on MAU in type 1 diabetes patients annually after 5 years from the onset of diabetes mellitus, and in patients with type 2 diabetes - annually from the moment of the diagnosis of diabetes. As nephropathy progresses, clear proteinuria appears, which gradually reaches the nephrotic level, and nephrotic syndrome forms. Renal function gradually decreases and, on average, after 15 - 20 years from the onset of diabetes, the terminal stage of chronic renal failure is recorded. Clinical symptoms in patients with uremic hundred DN diet is very diverse, it includes not only uremic disorders, but also manifestations of severe dysfunctions of other organs and systems. As a rule, diabetic retinopathy with a significant decrease in vision, peripheral and autonomic neuropathy, and cardiovascular pathology are found. Episodes of hypoglycemia become frequent. There is a tendency to hypovolemia. When prescribing preventive and therapeutic measures for patients with DN, it must be remembered that the main factors in the progression of nephrosclerosis are:

- Hyperglycemia,
- Nonspecific pathogenetic factors: A) intraglomerular hypertension, hyperfiltration in the remaining nephrons, B) systemic hypertension, C) proteinuria, D) oxidative stress, E) metabolic disorders,
- Aggravating factors.

Glycemic control is most important from the moment diabetes is diagnosed and in the early stages of DN. The target fasting blood glucose level is 5.1 - 6.5 mmol / L, postprandial glycemia should be in the range of 7.6 - 9.0 mmol / L, and glycated Hb should be 6.2 - 7.5%.

The main nephroprotective effect is carried out with the help of inhibitors ACE and angiotensin receptor blockers - 2 (EUCLID, PRIME studies, etc.).

Benefits of ACE Inhibitors and ARBs:

- Reduction of intraglomerular hypertension and hyperfiltration,
- Reduction of proteinuria,
- Increase in natriuresis, decrease in kaliyuresis,
- Strengthening the breakdown of low-density lipoproteins, a decrease in the synthesis of triglycerides, an increase in the formation of high-density lipoproteins,
- Increased sensitivity of receptors to insulin,
- Endothelium-protective effect.



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The choice of antihypertensive drugs is currently very wide. The main thing is to achieve the target blood pressure level: with proteinuria less than 1 g per day - 130/85 mm Hg., and with proteinuria more than 1 g per day - 125/75 mm Hg.

The antiproteinuric effect is possessed by ACE and ARB inhibitors (by reducing intraglomerular hypertension and endothelium-protective action), glycosaminoglycans (sulodexide), neutral endopeptidase blockers, etc.

The need to use lipid-lowering drugs is dictated not only by nephroprotection, but also by the prevention of the development and progression of atherosclerosis in patients with diabetes. Some modern lipid-lowering drugs are listed below:

- Atorvastatin (liprimar) 10, 20 and 40 mg;
- Simvastatin (Zocor) 10, 20 mg;
- Fluvastatin (Lescol) 20, 40 mg;
- Pravastatin (lipostat) 10, 20 mg;
- Lovastatin (mevacor) 10, 20 and 40 mg;
- Cerivastatin (lipobay) 0.1 and 0.2 mg, etc.

The target level of total blood cholesterol is below 5 mmol / L, low density lipoprotein cholesterol is below 3 mmol / L.

## **7. ACUTE RENAL FAILURE**

Acute renal failure (ARF) is a potentially reversible disorder of homeostatic renal function that develops within a few hours or days, most often ischemic or toxic genesis. Currently, the frequency of ARF in the population is approaching 200 per 1 million of the population, and it occurs 5 times more often in the elderly than in the young.

It is generally accepted to subdivide ARF into prerenal, caused by insufficient blood circulation of the kidneys, renal, caused by damage to the own renal parenchyma, and postrenal, associated with obstruction of the outflow of urine. With prerenal acute renal failure, renal function is completely preserved, however, hemodynamic disturbances and a decrease in circulating blood volume lead to renal vasoconstriction and a decrease in renal blood flow, as a result, the volume of blood perfused through the kidneys decreases, its insufficient purification from nitrogenous metabolites and the development of azotemia occur.

The main causes of prerenal ARF are:

- conditions accompanied by a decrease in cardiac output (traumatic and other shock, cardiac tamponade, arrhythmias, heart failure, pulmonary embolism);
- vasodilation (sepsis, anaphylaxis);



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- a decrease in the volume of extracellular fluid (burns, blood loss, dehydration, diarrhea, cirrhosis of the liver with ascites, nephrotic syndrome, peritonitis, transfusion of incompatible blood).

Prerenal ARF accounts for 40-60% of all cases of acute renal failure, however, with timely undiagnosed long-term persistent prerenal ARF, it can turn into renal, and renal hypoperfusion makes them more sensitive to various nephrotoxic stimuli, including drugs.

Renal ARF is caused by inflammation in the renal parenchyma and interstitium (acute glomerulonephritis, interstitial nephritis), vascular pathology (vasculitis, thrombosis of the renal arteries, veins, dissecting aortic aneurysm, exposure to exo- and endotoxins).

Postrenal ARF, accounting for approximately 5% of acute disorders renal function, in contrast to prerenal and renal, is often accompanied by anuria (less than 50 ml of urine per day), and the obstruction to the outflow of urine can be at any level, from the renal pelvis to the opening of the urethra.

Clinical picture

ARF stages:

1. phase of defeat (shock);
2. phase of oligoanuria;
3. phase of polyuria;
4. recovery phase

Treatment

Shock is the cause of ARF in 90% of cases, therefore shock therapy is the most important factor in the prevention and treatment of ARF. To replenish the volume of circulating blood, plasma, protein solutions, large-molecular dextran (rheopolyglukia) are used, which must be administered under the control of central venous pressure. Its increase to +10 cm of water column fraught with danger of pulmonary edema.

The diet of patients should be protein-free, but provide an intake of at least 1500-2000 kcal / day. If it is impossible to eat, glucose, mixtures of amino acids, intralipid are injected intravenously. Before starting therapy, it is necessary to clearly determine the cause and establish the type of acute renal failure - prerenal, postrenal or renal acute renal failure.

## 8. CHRONIC RENAL FAILURE

Chronic renal failure (CRF) is a symptom complex caused by the gradual and irreversible loss of functioning renal tissue, characterized by an increase in azotemia and other



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homeostatic disorders. The morphological substrate of chronic renal failure is nephrosclerosis.

On the clinical symptoms of chronic renal failure.

Chronic renal failure has a low-symptom course for a long time. In the initial stages, the diagnosis of chronic renal failure can only be established by laboratory examination. Clinical symptoms during this period are mild and have no diagnostic value. And yet we list them. Symptoms of initial CRF are general weakness, dry mouth, thirst, polyuria. These mild, nonspecific symptoms are lost among the vivid manifestations of the underlying renal disease.

As chronic renal failure progresses, symptoms of uremic intoxication appear and become prevalent. In a patient with severe chronic renal failure, as a rule, numerous symptoms of uremic lesions of various organs and systems are found. The main ones are headache; sleep disturbance; depressed, anxious mood; dyspnea; heartache; arterial hypertension; nausea and vomiting, more often in the morning, before meals, and sometimes many times during the day; loose stools; possible gastrointestinal bleeding; muscle weakness; paresthesia; bone pain; polyuria alternating with oliguria; etc. Such a variety of symptoms, and among them - not a single specific, in any way characteristic only for chronic renal failure. This nonspecificity of clinical manifestations made the diagnosis of chronic renal failure a prerogative of laboratory methods.

About the diagnosis of chronic renal failure.

Diagnosis of chronic renal failure is based primarily on the assessment of the level of nitrogenous toxins in the blood. It is generally known that the main criteria for renal failure are an increase in the concentration of creatinine (above 0.13 mmol / L) and urea (above 8.8 mmol / L), as well as a decrease in the glomerular filtration rate (total in all remaining nephrons). The latter is determined using clearance tests: the clearance of inulin, EDTA, creatinine and other substances that filter in the glomeruli, but do not undergo secretion and reabsorption in the tubules. In clinical practice, the clearance of endogenous creatinine is usually used, since its level is stable for each person and depends only on muscle mass. Creatinine is secreted to a small extent in the tubules, but the associated error in clinical practice is negligible. To assess the glomerular filtration rate (GFR) according to the Reberg test, it is necessary to determine the concentration of creatinine in the blood (CB), in the urine (CU) and the value of minute diuresis (MD):  
$$\text{GFR} = \text{CU} \times \text{MD} / \text{CB} \text{ (ml / min)}$$



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Knowing the minute diuresis and GFR, one can calculate the amount of reabsorbed water in the tubules. Normally, according to the Reberg test, the GFR is 80 - 120 ml / min, and the tubular reabsorption of water is 98 - 99%.

Stage	Characteristic	Glomerular filtration rate (GFR), ml/(min*1.73m <sup>2</sup> )	Recommended activities
I	Risk factors increased likelihood of developing CKD	>90	observation, measures to prevent the development of kidney pathology
II	signs of nephropathy, normal GFR.	60-89	Diagnostics and treatment of the underlying disease, aimed at achieving remission; reducing the risk of occurrence and slowing the progression of cardiovascular diseases.
III	moderate decrease in GFR.	30-59	moderate decrease in GFR. Nephroprotection, cardioprotection, detection and treatment of complications of CKD.
IV	marked decrease in GFR.	15-29	Detection and treatment of complications; preparation for RRT
V	Terminal chronic renal failure	<15 or dialysis treatment	RRT

## 9. Kidney stone disease (nephrolithiasis)

Urolithiasis is the presence in the urinary tract of insoluble calculi resulting from the precipitation of chemicals in the urine when their concentration exceeds the solubility limit. The main factors contributing to the formation of calculi in the urinary system:

- 1) high concentration of lithogenic compounds in urine, such as oxalates, calcium, phosphates, uric acid, cystine;
- 2) urinary retention;
- 3) urinary tract infection (UTI). Most calculi are formed from calcium oxalate, less often from calcium phosphates, urates, struvite and cystine. Etiology and pathogenesis of the main forms of nephrolithiasis → tab. 14.6-1. Calculi can form in different parts of the urinary tract, most often in the calyx or renal pelvis, and move into the ureter and bladder, where they can enlarge or will be excreted in the urine. Sometimes they reach significant sizes, fill the entire renal pelvis with calyces (coral stones) and lead to kidney damage.

### CLINICAL PICTURE

A typical symptom is renal colic - from severe, unbearable pain in the lumbar region, radiating to the pubic joint, external genitals and inner thighs to unexpressed lower back pain (then it is not called colic); if the urethra is blocked, pain in the suprapubic region. Pain occurs when a calculus is pushed through the narrow lumen of the ureter, causing a non-physiological spasm. May be accompanied by nausea and vomiting, urge to urinate and frequent urination with a small amount of urine, chills and fever (if UTI coexists),



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even hypotension and fainting (with very severe pain), sometimes hematuria. On physical examination: soreness in the kidney area on the side of colic (a sharply positive symptom of tapping (Pasternatsky) and increased muscle tension on the diseased side. The pain subsides after unblocking the outflow of urine (movement of the calculus to the bladder and spontaneous evacuation). In  $\approx 50\%$  of cases, renal stone the disease has a recurrent course.

### Kidney stone disease diagnosis

It is determined based on clinical symptoms (usually an attack of renal colic) and results of imaging studies and urinalysis. More often, nephrolithiasis is diagnosed accidentally during imaging studies for another reason.

### Additional research methods

**1. General urine analysis:** in 3/4 of cases, microhematuria or macrohematuria, in  $\approx 3\%$  of patients, leukocyturia and bacteriuria due to concomitant UTI.

**2. Blood tests:** there are no specific abnormalities, often moderate leukocytosis ( $< 15,000 / \mu\text{l}$ ); higher leukocytosis, increased ESR, and increased CRP levels indicate a UTI.

**3. Imaging studies:** to visualize calculi and assess the expansion of the urinary tract. A survey RG of the abdomen can reveal X-ray-positive calculi and, together with ultrasound, is a preliminary imaging study in patients with a history of renal colic.

**Ultrasound of the urinary tract** is a preliminary imaging study in patients with a history of renal colic, a first-choice study in pregnant women.

**Spiral CT** without the introduction of a contrast agent - performed in case of diagnostic doubts or as an imaging study of the first choice.

**CT urography** - performed if CT without contrast did not provide the necessary diagnostic information, as well as if surgical intervention is planned.

## 2.2. Development of practical / seminar / laboratory classes

The study of the theoretical part of the disciplines is designed not only to deepen and consolidate the knowledge gained in the classroom, but also to promote the development of students' creative skills, initiative and organize their time.

Individual work in the study of disciplines includes:

- reading by students of the recommended literature and assimilation of the theoretical material of the discipline;
- acquaintance with Internet sources;
- preparation for various forms of control (tests);



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- preparation and writing of abstracts;
- performance of control works;

The material outlined in the lectures must be regularly worked out and supplemented with information from other sources of literature presented not only in the discipline program, but also in periodicals.

When studying the discipline, you first need to read the recommended literature on each topic and make a short summary of the main provisions, terms, information that require memorization and are fundamental in this topic for mastering the subsequent topics of the course. To expand knowledge of the discipline, it is recommended to use Internet resources; conduct searches in various systems and use materials from sites recommended by the teacher.

### **3. Methodical recommendations / instructions for students**

#### **3.1. Methodical recommendations for students on the study of the discipline.**

The study of the theoretical part of the disciplines is designed not only to deepen and consolidate the knowledge gained in audiclases, but also to promote the development of students' creative skills, initiative and organize their time.

The lecture notes must be regularly worked out and supplemented with information from other sources of literature presented not only in the discipline program, but also in periodicals.

When studying the discipline, you first need to read the recommended literature on each topic and make a short summary of the main provisions, terms, information that require memorization and are fundamental in this topic for mastering the subsequent topics of the course. To expand knowledge of the discipline, it is recommended to use Internet resources; conduct searches in various systems and use materials from sites recommended by the teacher.

Each student maintains a workbook, the design of which must meet the requirements, the main of which are as follows:

- indicate the subject, course, group, surname, name, patronymic of the student on the title page;
- each work is numbered in accordance with the methodological instructions, indicate the date of the work;
- completely write down the name of the work, the purpose and principle of the method, briefly characterize the progress of the task and the object of research;



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- if necessary, provide a graphic image; the results of the assignments are presented in the form of graphic images with obligatory signatures to them, as well as tables or described verbally;
- at the end of each work, a conclusion is made, which are discussed when summing up the results of the lesson.

All primary entries must be made in a notebook in the course of completing tasks.

To check the academic activity and the quality of the student's work, the teacher periodically checks the workbook.

The material outlined in the lectures must be regularly worked out and supplemented with information from other sources of literature presented not only in the discipline program, but also in periodicals.

When studying the discipline, you first need to read the recommended literature on each topic and make a short summary of the main provisions, terms, information that require memorization and are fundamental in this topic for mastering the subsequent topics of the course. To expand knowledge of the discipline, it is recommended to use Internet resources; conduct searches in various systems and use materials from sites recommended by the teacher.

### **3.2 Methodical recommendations for practical exercises**

Cardiology Discipline includes credit and exam. At the end of the study of all topics, the results of the students' work in practical classes are summed up by summing up all the points earned. The student cannot earn points only at the checkpoint, since the current control is also assessed by a certain number of points.

The maximum number of points a student can earn per semester is 100 points. Since the student performs various types of work, receives for them not only the maximum, but also the minimum number of points, the result (amount) obtained depends entirely on his activity during the semester.

Before each practical lesson, the student studies the plan of the seminar with a list of topics and questions, a list of references and homework based on the material presented to the seminar. The following scheme of preparation for the seminar is recommended for the student:

1. work out the lecture notes;
2. read the basic and additional literature recommended for the studied section;
3. answer the questions of the plan of the seminar lesson;
4. study the topic and select literature for writing abstracts, reports, etc.;



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5. solve the assigned homework;
6. all types of individual work (abstract, report, presentation, situational tasks, role-playing games) involve preparation according to the list of literature and sources that are given in the section of the syllabus "List of sources and literature";
7. in case of difficulty, formulate questions to the teacher.

### **3.3. Methodological recommendations for the preparation of individual work.**

**Individual work of students is aimed at solving the following tasks:**

- development of skills of perception and analysis of professional information;
- development and improvement of the ability to make decisions and implement them;
- development and improvement of creative abilities in the self study of professional problems.

To solve the first problem, students are offered monographs and scientific articles on the problems of human biochemistry for reading and meaningful analysis. The results of working with texts are discussed at seminars and colloquia.

To develop the skills of individual work, students complete tasks, independently referring to educational, reference and scientific-methodological literature. Checking the fulfillment of tasks is carried out both at seminars with the help of oral presentations of students and their collective discussion, and with the help of written individual work.

To develop and improve the communication skills of students, special training sessions are organized in the form of "disputes" or "Conferences", in preparation for which students are assigned in advance into groups defending one or another point of view on the problem under discussion.

### **3.4 Methodological recommendations for the preparation of written works**

**Abstract** - a summary in writing of the content of scientific work on the topic provided. This is an individual research work, where the student reveals the essence of the problem under study with elements of analysis on the topic of the abstract. Provides various points of view, as well as his own views on the problems of the abstract topic. The content of the abstract should be logical, the presentation of the material should carry problematic and thematic in nature.

**Requirements for abstract design:**

The volume of the abstract can vary within 5-7 printed pages. Main sections: table of content (plan), introduction, main content, conclusion, list of references.



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The abstract text should contain the following sections:

- title page indicating: the name of the university, department, topic of the abstract, author's full name and full name of the teacher:

- introduction, relevance of the topic;
- main section;
- conclusion (analysis of literature search results); conclusions.
- the list of literature sources must have at least 10 bibliographic titles, including online resources.

**The textual part of the abstract** is drawn up on a sheet of the following format:

- top margin - 2 cm; left indent - 3 cm; indent on the right - 1.5 cm; bottom margin - 2.5 cm;
- text font: Times New Roman, font height - 14, space - 1.5;
- page numbering - from the bottom of the sheet. There is no number on the first page.

The essay must be completed correctly in compliance with the culture of presentation. There must be references to the literature used, including periodicals for the last 5 years.

**Abstract evaluation criteria:**

- relevance of the research topic;
- correspondence of the content to the topic;
- depth of elaboration of the material;
- the correctness and completeness of the development of the questions raised;
- the significance of the conclusions for further practical activities;
- the correctness and completeness of the use of literature;
- compliance of the abstract design with the standard;
- the quality of the message and answers to questions when defending the abstract.

**Methodical recommendations for the preparation of messages and reports.**

**Report** is a public announcement, which is a detailed presentation of a specific topic.

**Stages of preparation of the report:**

1. Determination of the purpose of the report.
2. Selection of the necessary material that determines the content of the report.
3. Drawing up a report plan, distributing the collected material in the necessary logical sequence.

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4. General acquaintance with the literature and highlighting the main thing among the sources.
5. Refinement of the plan, selection of material for each point of the plan.
6. Compositional presentation of the report.
7. Memorization of the text of the report, preparation of theses of the speech.
8. Making a presentation.
9. Discussion of the report.

**The compositional design of the report** is its real speech external structure, it reflects the ratio of parts of the speech according to their purpose, stylistic features, volume, combination of rational and emotional moments, as a rule, elements of the composition of the report are: introduction, definition of the subject of speech, presentation (refutation), conclusion.

**The performance consists of the following parts:**

1. An introduction helps to ensure a successful presentation on any topic. The introduction should contain:
  - title of the report;
  - message of the main idea;
  - modern assessment of the subject of presentation;
  - a short listing of the issues under consideration;
  - an interesting presentation form for listeners;
  - emphasizing the originality of the approach
2. The main part, in which the speaker must reveal the essence of the topic, is usually built on the principle of a report. The main task is to provide enough data for the audience to become interested in the topic and want to read the materials.
3. Conclusion - this is a clear generalization and short conclusions on the stated topic.

**3.5. Methodical instructions for preparation for the final certification.**

Final certification in the form of a credit in the discipline "Public health" is carried out based on the results of attending classes, current and midterm (modular) control.

In this regard, for the successful passing of the final control, it is recommended to attend all classes and actively participate in classroom studies and the student's individual work.

All modules are carried out according to a modular schedule. The tests themselves have three sections: exam, module and training mode. The exam and the module are

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available on schedule, the training mode is available on the electronic educational platform [www.test.edu.kg](http://www.test.edu.kg), where students can practice solving tests online.

Methodological materials are also placed on the electronic educational platform [www.test.edu.kg](http://www.test.edu.kg). Each student has his own ID number and password to enter this platform. The student has the ability to log into the system both from a computer, from a tablet and from a phone, select a discipline and, for each topic of the selected discipline, view the necessary training materials, lecture notes (in PPT or PDF format), and complete a test task (MCQ).

### **3.6. Methodical recommendations for the student's research work.**

The purpose of the student's research work is to develop the intellectual abilities of students by studying the algorithm of scientific research and gaining initial experience in the implementation of a research project on the educational material of the chosen specialty.

The main tasks and results of the implementation of scientific research work are:

- mastering scientific methods of cognition and deepening the theoretical knowledge of students in the specialty;
- mastering modern methods of scientific research;
- development of students' practical skills of individual search for scientific and technical information, conducting theoretical and / or experimental work;
- acquisition by students of the ability to analyze the results of research, formulate conclusions and recommendations;
- development of students' ability for individual, creative, vigorous activity in continuous renewal and enrichment of scientific baggage.

When performing SRW, you must learn the following basic steps:

- independent search for information on a given topic;
- selection of essential information necessary for full coverage of the problem under study, separation of this information from secondary (within the framework of this topic);
- analysis and synthesis of knowledge and research on the problem;
- generalization and classification of information on research problems;
- logical and consistent disclosure of the topic;
- generalization of psychological knowledge on the problem and the formulation of conclusions from the literature review of the material;



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- stylistically correct design of a scientific thought of an abstract type;
- competent design of scientific abstract text;
- correct design of scientific papers

#### 4. Glossary

##### **Autologous blood salvage (ABS)**

A technique for collecting blood lost by a patient during a surgical operation and then returning it to the patient.

Automatic peritoneal dialysis, dialysis fluid flow control.

##### **Apheresis**

Automatic collection of a large volume of one of the blood components from a donor, or removal of a specific blood component from a patient. In this case, the rest of the blood components are returned to the donor (patient).

##### **Autologous**

A component or product of the same organism.

##### **Biocompatible**

A technique that allows you to control biological systems, while simultaneously receiving information about changes in the parameters of these systems.

##### **Biomaterials**

Synthetic biocompatible materials.

##### **Bio sensor**

A device for measuring biological characteristics, such as the volume of circulating blood.

##### **Blood bank technology**

Products and services that enable blood centers to collect, purify and store blood components. In addition, this concept includes methods for reducing the impurity of leukocytes in blood components, inactivation of pathogens and others.

##### **White blood cells (Leukocytes)**

White blood cells (leukocytes) - nuclear cells circulating in the blood, are subdivided into several types. The main purpose is to protect the body from infections, parasites, allergies, etc.

##### **High Flux Membrane**

A highly flux membrane, that is, a membrane that is better than usual passes liquid and substances dissolved in it.

##### **Water Treatment**



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Water preparation for hemodialysis, which consists in reducing the level of solutes and microbiological contaminants to a safe level.

### **Glomerulonephritis**

Glomerulonephritis is an inflammation of the renal glomeruli.

### **Gene Therapy**

Gene therapy is the placement of modified genes into the walls of the blood vessels of the heart, causing them to grow bypassing the blocked area.

### **Glomerulus**

A very small glomerulus of capillaries in the nephron.

### **Hemodiafiltration (HDF)**

A procedure in which accumulated metabolic products are removed from the blood through a highly permeable membrane through a combination of diffusion and convection.

### **Hemodialysis (HD)**

A procedure in which the patient's blood and dialysis solution are pumped from opposite sides of a semi-permeable membrane towards each other. In this case, metabolic products pass through the membrane from the blood into the solution and are carried away by it. Excess fluid from the patient's body also passes through the membrane due to the pressure difference created by the dialysis machine, which controls the procedure and ensures its safety.

### **Hemofiltration (HF)**

A procedure designed to remove metabolic products from the patient's body by convection transport and ultrafiltration through a highly permeable membrane. The amount of ultrafiltration exceeds the patient's fluid loss, which is required by the physician. The difference is compensated by the infusion of sterile, pyrogen-free infusion solution.

### **Dialysis**

Artificial blood purification, a procedure necessary for patients with acute lesions and chronic kidney disease.

### **Dialysis Concentrate**

Dialysis concentrate is an electrolyte solution that, after dilution with water, turns into a dialysis solution. It can also be supplied in the form of a powder, which is automatically diluted with a dialysis machine.

### **Dialysis Machine / Monitor**



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A device that controls and monitors the flow of blood and dialysis fluid through an artificial kidney during a hemodialysis procedure. In addition, the machine prepares a dialysis solution from concentrates and water.

### **Dialyzer**

A type of membrane filter used in the hemodialysis procedure, in which the patient's blood is pumped from one side of the membrane, and the dialysis solution on the other.

### **Diffusion**

The movement of a solute from an area with a higher concentration to an area with a lower concentration, i.e. along the concentration gradient.

### **Hollow fiber**

A type of membrane organized in the form of a bundle of thin tubes, through the walls of which matter is transferred.

### **Artificial kidney**

#### **Blood cell, red**

Red blood cells (erythrocytes). They circulate in arteries and veins, transport oxygen from the lungs to the tissues.

#### **Blood components**

Blood components. Blood is made up of red cells, white cells, platelets, and plasma.

#### **Blood gas**

Blood gases.

#### **Cannulae**

Cannulas. Tubes of various geometries for accessing the patient's blood.

#### **Coagulation**

The process of blood clot formation.

#### **Red Blood Cells (Erythrocytes)**

Red blood cells, small flexible discs whose main function is to deliver oxygen from the lungs to the tissues. Also called erythrocytes.

#### **Convective Therapies**

Dialysis procedures used those that use the convection mechanism of transfer of matter through the membrane are preferable to those using diffusion transport, since convection removes a wider range of solutes. Convection requires highly permeable membranes and large volumes of sterile infusion solutions.

#### **Controlling the amount of liquid - Volume Control**



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Control of the amount of fluid removed from the patient during the hemodialysis procedure. A patient with impaired renal function accumulates about 1 liter of excess fluid per day.

### **Leukoreduction**

Reduction of undesirable impurity of leukocytes in the erythrocyte or platelet mass obtained from the donor.

Leukocytes, White blood cells - White Blood cells (Leukocytes)

White blood cells (leukocytes) - nuclear cells circulating in the blood, are subdivided into several types. The main purpose is to protect the body from infections, parasites, allergies, etc.

### **Blood lines**

Lines used to connect the patient and the device.

Glomerular membrane – Bowman's capsule

The membrane of the renal glomerulus. This is where primary urine is formed.

### **Nephron**

The smallest functional unit of the kidney capable of producing urine on its own.

### **Kidney**

Kidneys. Approximately 1,700 liters of blood passes daily through the human kidneys, which contain approximately 2,000,000 nephrons. The nephron is the smallest functional unit of the kidney. Each nephron is capable of purifying the blood and producing urea. In each nephron, blood enters the glomerulus, a small glomerulus from the capillaries. Here, a significant part of the liquid composing blood leaves the capillaries through their walls. This liquid contains water, slags, salts and many nutrients. This so-called "primary urine" is collected in the "Bowman's capsule" surrounding the glomerulus. Then the primary urine is concentrated. Most of the water, salt and nutrients are absorbed back into the bloodstream. Urea remains, dissolved in a small amount of water, which collects in the renal pelvis and enters the bladder through the ureter.

PTP Personal treatment program.

### **Pathogen Inactivation**

The process of inactivation of viruses, bacteria and other pathogens that may be in donated blood.

### **PD Cycler**

A device that provides flows of peritoneal dialysis (PD) solution into and out of a patient. The procedure is usually performed at night.

### **Peritoneal Dialysis (PD)**



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Peritoneal dialysis is a type of dialysis in which, unlike hemodialysis, the blood is purified without removing it from the human body. Instead, a cleaning solution is injected into the patient's abdominal cavity. The role of the dialysis membrane is played by the peritoneum. The procedure requires sterile solutions in plastic bags, lines for connecting them to the patient and, in some cases, an apparatus for filling and emptying the abdominal cavity. In the most common form of peritoneal dialysis, known as CAPD (Continuous Ambulatory Peritoneal Dialysis), the patient manually replaces the solution every four hours. With APD (Automated Peritoneal Dialysis) - automatic peritoneal dialysis, the procedure is carried out using a machine while sleeping.

### **Plasma**

The liquid part of the blood that carries nutrients, salts, metabolic products - slags and other substances.

**Preoperative Apheresis** Removal of specific components of the patient's blood (apheresis) prior to surgery.

### **Stem Cells**

Blood stem cells are found in the bone marrow and in small quantities in the peripheral blood. They are the ancestors of all blood cells, subsequently developing into white, red blood cells, or platelets.

### **Stem Cell Therapy**

Stem cells are taken from the blood and then injected into the patient, who is able to make new blood. Cancer patients may need stem cell infusion after treatment with cytostatics and chemotherapy.

### **Synthetic Membrane**

Diaphragms made of synthetic materials. They are a modern alternative to cellulose membranes.

Cardiovascular diseases.

### **Blood platelets**

The task of platelets is to stop bleeding when tissue is damaged. They tend to stick together and form the basis of a blood clot.

End Stage Renal Disease - ESRD (End Stage Renal Disease)

End-stage renal disease - impaired renal function leading to toxicity if the patient is not receiving hemodialysis treatment or a kidney transplant.

### **Platelet**

Platelets provide thrombus formation, stop bleeding.

### **Platelet Gel**



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Platelet gel is a jelly-like material made from platelets and inducing the formation of a blood clot.

### **Therapeutic Apheresis**

Damaged or diseased blood cells or contaminated plasma are removed from the patient and are replaced with donor or artificial components.

### **Transfusion Medicine**

Transfusion medicine is a field of medicine that deals with the collection of various blood components from healthy donors for transfusion to patients for therapeutic purposes.

### **Ultrafiltration**

The movement of a liquid through a membrane under the influence of a pressure gradient.

### **Unica Bag**

Brand name for a bag of peritoneal dialysis solution, the concentration of glucose in which can be changed by opening its different compartments.

### **Flat Sheet**

A type of oxygenator with a lamellar membrane.

### **CKD**

Chronic kidney disease

Extracorporeal

Extracorporeal. Located or originating outside the patient's body.

**5. Reference materials and applications** - *indicated as necessary.*