**Ministry of Health of the Republic of Belarus**
**Education Institution**
**"Gomel State Medical University"**

Department of Pediatrics with the course of the Faculty of Advanced Training and Retraining

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# METHODOLOGICAL GUIDELINES

for a practical exercise
by a teacher with students
4th year of the Faculty of foreign students,
trainees in speciality 1-790101 in the discipline of pediatrics

## Topic: Acute post-streptococcal glomerulonephritis. Nephrotic syndrome. Acute renal damage. Chronic kidney disease.

Time: 6 hours

Approved at the meeting of the Department of Pediatrics with the Course of the Faculty of Advanced Training and Retraining
(protocol №. 8 of the 14th of June 2022)

2022

## LEARNING AND EDUCATIONAL OBJECTIVES, TASKS, MOTIVATION FOR LEARNING THE TOPIC

**Learning objective:**

- to form students' basic professional competence while studying the discipline of Pediatrics according to the curriculum
- to form students' scientific knowledge of acute post-streptococcal glomerulonephritis. Nephrotic syndrome, acute renal damage, chronic kidney disease_in children and their prospects of use in professional activity; skills and abilities necessary for work with patients of different age, knowledge of clinical manifestations of diseases, treatment and diagnostic measures, bases of rehabilitation and prophylaxis.

**Educational objective:**

- to foster students' sense of professional responsibility of a future medical worker;
- formation of professionally significant and socially-psychological qualities of the doctor's personality in the system of doctor-nurse-patient relations;
- formation of students' responsible attitude to their future professional activity;
- formation of academic and work discipline, discussion of disciplinary issues (attendance at lectures and practical classes, unexcused absences, tardiness, arrears on missed classes).

**Objectives:**

As a result of the study session, the student will

**know**:

- Anatomical and physiological features of the urinary system organs predisposing to kidney disease;
- modern classification of glomerulonephritis in children;
- Diagnostic criteria for kidney damage (ultrasound, X-ray, renoradiography and other methods);
- the necessary amount of laboratory tests (clinical, biochemical, immunological) in glomerulonephritis.

**be able to:**

- objectively assess the state of the urinary system and identify the main symptoms of kidney damage;
- establish a correlation relationship of the identified changes with the occurrence of glomerulonephritis by thorough collection of anamnesis, selection of information from the history of development;
- build an algorithm for the diagnosis of kidney disease;
- determine the group of nosologies for differential diagnosis;
- build a plan of examination (clinical, laboratory, instrumental) of the patient with glomerulonephritis;
- interpret the results of the examination, establish their natural relationship.

**know**:

- methods of objective (palpation, percussion, auscultation) and additional (measuring, laboratory, instrumental, histological, immunological, etc.) examination
- communicate with patients of different ages and their parents, medical staff.

## MATERIAL EQUIPMENT

Tables on the theme of the lesson, medical records of hospital patients, a set of hemograms, biochemical blood tests, urine tests, data results of daily blood pressure monitoring, kidney ultrasound investigation reports, set of X-rays, tonometers, scales, stadiometer; task bank for independent work; selection of case studies of patients in the hospital departments.

## CONTROL QUESTIONS FROM RELATED DISCIPLINES

1. "Microbiology:
- . Characteristics of causative agents of viral, bacterial infections;
2. "Normal Physiology":
- Interpretation of normal constants in the age aspect;
3. "Pharmacology":
- Classification of antibiotics and their mechanism of action;
- Side effects of hormonal drugs.

## CONTROL QUESTIONS ON THE TOPIC OF THE CLASS

1.Acute post-streptococcal glomerulonephritis: definition, etiology, pathogenesis, classification, clinic, diagnosis, treatment, prevention.

2. Nephrotic syndrome: definition, etiology, pathogenesis, classification, clinic, diagnosis, treatment, prevention.

3. Differential diagnosis of urinary syndrome.

4. Acute kidney injury: etiology, pathogenesis, classification, clinical and diagnostic criteria by stage, principles of treatment by stage. Indications for renal replacement therapy. Medical rehabilitation.

5. Chronic kidney disease: etiology, pathogenesis, classification, clinical and diagnostic criteria by stages, principles of conservative therapy. Indications for program dialysis. Medical rehabilitation.

6. Dispensary care for children with acute post-streptococcal glomerulonephritis, nephrotic syndrome.

## PROCESS OF THE SESSION

### Theoretical part

Glomerulonephritis is a heterogeneous group of diseases characterised by immunological and clinical and morphological features of inflammation associated primarily with glomerular damage.

In most cases, glomerulonephritis is regarded as an independent nosological form of renal disease. However, it is often a consequence of renal damage from systemic connective tissue diseases. Glomerulonephritis in children accounts for

32.1% of all kidney diseases. Nephrotic form of chronic glomerulonephritis is observed in 47%, haematuric - 27%, mixed - 24%.

Glomerulonephritis is the most common cause of CKD. Patients with glomerulonephritis constitute the main contingent of the haemodialysis and renal transplantation units.

It is essential for every physician to be aware of this disease.[10]

**Practical part**

The instruction of students is carried out, the attention to the rules of the internal schedule, features of work in paediatric department №5 (profile nephrological) is paid. The selection of patients is carried out in accordance with the theme of the lesson. During the practical work the student must carry out:

- collection of complaints and anamnesis,
- clinical examination of the child,
- make a preliminary diagnosis and develop a plan of examination,
- Interpret the results of the laboratory and instrumental methods of investigation,
- Formulation of the final clinical diagnosis,
- Formulation of a treatment and rehabilitation plan,
- writing prescriptions for medicines.

**Monitoring the learning of the topic**

**1. Demonstration of case studies with clinical case studies:**

- Acute post-streptococcal glomerulonephritis,
- nephrotic syndrome,
- Chronic kidney disease.

**2. Evaluate urine tests.**

**3.Solution of situational tasks**

**Task №1.**

A 6-year-old girl comes to the clinic with complaints of abdominal pain and fever of up to 39 degrees.

She had an acute illness. She was ill for the 2nd day.

Objective examination: condition is acute with symptoms of intoxication. The patient has proper build, satisfactory nutrition. Her skin was clean and pale. Mucous membranes were moist, pharynx was calm. No catarrhal symptoms.

The lung breathing is vesicular, conducted to all parts, the number of breaths 28 per minute. Cardiac activity is rhythmic, tachycardia up to 136 beats per minute. The abdomen is soft, painful on palpation in all parts. The liver and spleen were not enlarged. Stools were formed 1 time. Urination 7 times, painless.

Questions:

1. What is your preliminary diagnosis?
2. Make an examination plan for the child to confirm the diagnosis.
3. A presumptive outcome of the illness.

**Task №2.**

A 10-year-old boy was re-admitted to the nephrology department of a children's city hospital with the diagnosis of glomerulonephritis. At the age of nine he had had chicken pox and had developed swelling of the face, shins and scrotum. Additional examination revealed proteinuria up to 4 g/day, hypo- and dysproteinemia, hypercholesterolemia, microhematuria up to 5 erythrocytes per field of view. At the beginning of the disease there was transient hypertension up to 140/100 mmHg, elevated blood urea levels up to 10.5 mmol/l. Prednisolone treatment at a dose of 2 mg/kg/day was effective, but proteinuria and oedema reappeared when the dose was reduced to less than 15 mg/day. During the last year he had three acute respiratory infections and one sore throat. The background of intercurrent diseases was associated with recurrent kidney disease. The oedema syndrome has become more persistent with time. Proteinuria and moderate peripheral edema persisted during the last exacerbation of the disease, hepatension within 130-150/90-110 mmHg persisted for a long time. Urinalysis shows protein - 3.3 g/l, leucocytes 10-15, erythrocytes 5-10 per field of view.

What is your diagnosis? Specify the plan of additional examination and treatment.

**GUIDELINES FOR ORGANISING AND CARRYING OUT THE SIW**

**The time allocated for independent work is used by students for:**

- Studying the topics (issues) for independent study;
- problem solving;
- research and creative assignments;
- preparing thematic reports, presentations;
- completing practical assignments;
- designing information and demonstration materials (stands, posters, charts, tables, newspapers, etc.);
- compilation of thematic selection of literary sources, internet sources;
- Duty in health care organisations;
- make a review of scientific literature on the issues of the class.
- drawing up situational tasks on the topic of the class.

**The main methods of organizing independent work:**

- making a report;
- Exploring topics and problems that are not covered in the classroom;
- preparation and participation in active forms of learning.

**The list of SIW tasks:**

- study of clinical guidelines (examination and treatment protocols) for children with renal pathology.
- Case studies on the topic of the class:

acute post-streptococcal glomerulonephritis
acute kidney damage
nephrotic syndrome
chronic kidney disease

- Write prescriptions for the main groups of drugs used in nephrology.
- performance of the research work on the topic of the class.

## GUIDELINES FOR ORGANISING AND CARRYING OUT THE USRS

**The recommended forms of USRS organisation are:**

1. preparation of abstracts on the proposed topics;
2. solving case studies on the theme of the class;
3. tests on the subject of the lesson.

**List of GSSS tasks:**

**1. Prepare an essay on the proposed topic:**

- Renal tubular acidosis (Albright syndrome).
- De Tony-Debre-Fanconi syndrome.
- Haemolytic-uremic syndrome.
- Hereditary nephritis.
- Solution of situational tsks :

**Task № 1.**

An 8 year old boy was examined. The mother was pregnant with threatened abortion and progesterone was administered. At 32 weeks' gestation the mother had sepsis, haematogenous osteomyelitis, clinical death. She had been treated with narcotics and antibiotics for a long period of time.

The child had manifestations of food and drug polyallergies (rash, Quincke's edema, allergic laryngeal edema) from the first year of life.

From the age of two years, urine tests showed microhematuria, traces of protein. Ultrasound revealed decreased size of both kidneys.

At age 5 after an acute respiratory viral infections she had lethargy, headache, oliguria, edema of face, shins, anterior abdominal wall, ascites. Urinalysis showed marked proteinuria (over 3.3 g/l), microhematuria, hyaline cylinders. BP 140/100 mmHg.

Biochemical blood tests: hypo- and dysproteinemia, hypercholesterolemia.

Thereafter the disease had a continuously relapsing course. From the age of 6 years, growth retardation and lack of weight gain, nasal bleeding were noted. Daily protein loss reached 15 g, anemia was detected (hemoglobin 86 g/l), persistent hypertension.

Task:

1. Distinguish the pathological syndromes.
2. Formulate a clinical diagnosis and justify it.
3. outline a plan for the examination of the patient.
4. With which pathology should the differential diagnosis be made?
5. Prescribe treatment for the patient with doses and names of drugs.

**Task№2**.

A 12-year-old boy was hospitalized. Past medical history includes frequent acute respiratory infections, otitis media. At age 9 after sore throat changes in urine were revealed for the first time: traces of protein, microhematuria. After detecting a moderate increase in urate excretion the patient was diagnosed as dysmetabolic

nephropathy. Subsequently, lethargy and headaches appeared. He did not consult a doctor.

The patient was admitted to the hospital by an emergency physician on the seventh day after the beginning of the acute respiratory tract infection due to sudden worsening of his condition: abrupt weakness, dizziness, headache, pallor, cold sweat, tremor of hands, vomiting, pastosity of face and shins, BP 150/110 mmHg, oliguria, macrohematuria. Urinalysis revealed proteinuria 3.3 g/l, erythrocytes covering all visual fields.

Task:

1. Distinguish the pathological syndromes.
2. Formulate a clinical diagnosis and justify it.
3. outline a plan for the examination of the patient.
4. With which pathology should the differential diagnosis be made?
5. Prescribe treatment for the patient with the doses and names of the drugs.

**Task №3.**

An 8-year-old girl was examined in the nephrology department on a routine basis. Changes in urine in the form of minor proteinuria (up to 1 g/l), "borderline" leukocyturia and single erythrocytes were first detected in the first year of life during a follow-up examination. Thereafter, an irregular urinary syndrome was noted. Proteinuria and urine dosage increased against the background of intercurrent diseases. The condition was regarded as a 'urinary tract infection', but the urosepsis had no effect on the urinalysis pattern.

The clinic revealed retardation in physical development (height 117 cm, body weight 18.5 kg), multiple stigmas of dysembryogenesis (ability to overextend at the elbow joints, excessive flexibility of the spine, diastasis of the rectus abdominis muscles). BP within 100/60-90/40 mmHg. No swelling or pasosity.

Excretory urography: uneven contours of the right kidney, eccentric location of the pelvis, enlargement of the upper calyx group, increased mobility of the left kidney.

Radioisotopic radiography: decreased secretory function of both kidneys.

Zimnitskiy urine analysis: specific gravity varies between 1005-1010, nocturnal urine output exceeds daily urine output.

Daily excretion of ammonium ions - 5-7 mmol/l (when the norm is about 30 mmol/l).

Urine cultures for flora and sensitivity to antibiotics: no growth. No laboratory signs of active inflammation.

Blood chemistry: total protein - 59 g/l, creatinine - 0.16 mmol/l.

Cluchal filtration - 48-53 ml/min, tubal reabsorption - 95-96%.

Task:

1. Identify the pathological syndromes.
2. Formulate a clinical diagnosis and justify it.
3. outline a plan for the examination of the patient.
4. With which pathology should the differential diagnosis be made?
5. Prescribe treatment for the patient with doses and names of drugs.

**Task №4**.

Child Sasha M., 11 years old. The medical history states that during a week he had daily fever up to 39,20°C, felt unwell. His clinical blood test revealed an acceleration of sedimentation rate to 60 mm/hour. The patient was admitted to hospital.

On examination the skin was pale, no edema. Oropharyngeal mucosa without hyperemia. Nasal breathing was free. Above the lungs breathing is vesicular, conducted in all fields without rales. The heart rate was 70 per minute. BP - 100/50 mm Hg. The abdomen is soft, accessible to deep palpation in all parts. Gallbladder symptoms are negative. The kidneys are not palpated, Pasternatsky's symptom is negative. The patient urinated frequently, 2.5 l of urine per day, the urine was light.

Blood count: hemoglobin - 90 g/l, erythrocytes - 4.5×1012/l, leukocytes - 5.7×109/l, n - 0%, s - 44%, m - 2%, b - 2%, e - 2%, l - 50%, platelets - 300×109/l, sed rate - 63 mm/hr.

General urinalysis: number - 300 ml, colour - c/j, relative density - 1003, glucose - 9 g/l, protein - negative, leukocytes - 8-10 in the field of view, red blood cells - single in the field of view.

Urine for bacteriological culture: no microflora growth.

Biochemical blood analysis: total protein - 62 g/l, albumin - 60%, globulin: alpha-1 - 2%, alpha-2 - 4%, beta - 8%, gamma - 26%; cholesterol - 4 mmol/l, urea - 10 mmol/l, creatinine - 300 µmol/l, potassium - 4.3 mmol/l, glucose - 5.1 mmol/l.

Daily proteinuria: no protein detected.

Zimnitsky's test: daily diuresis - 800 ml, nocturnal diuresis - 1800 ml. Relative density - 1000-1008.

Task:

1. Identify the pathological syndromes.
2. Formulate a clinical diagnosis and justify it.
3. outline a plan for the examination of the patient.
4. With which pathology should the differential diagnosis be made?
5. Prescribe treatment for the patient with the doses and names of the drugs.

**Task №5**.

A 4-year-old child is admitted to the hospital with extensive burns. On the 3rd day after admission doctors diagnosed acute kidney damage.

Task:

1. What clinical symptoms suggest this condition?
2. What are the laboratory changes in acute kidney injury?
3. What is oliguria?
4. List the indications for dialysis therapy in acute kidney injury.
5. What is the pathogenesis of acute kidney injury in extensive burns.

**Task №6**.

A 2-year-old 3-month old child was admitted to the emergency room of an infectious diseases ward at 12:15 p.m. Weight - 14 kg. Complaints: fast stool up to 7 times a day, stool with blood, vomiting twice a day, body temperature 39.5 degrees. Refuses to drink. There was an outbreak of dysentery in the kindergarten group the child attends.

On examination the skin was pale, sclera icteric. Perioral-petechial rash. Dyspnea - up to 45 per minute. Tachycardia - up to 140 min. BP -80/40 mm Hg. Abdomen tense, painful, but symptoms of peritoneal irritation were negative. His last urine was at 9pm the previous day.

Task:

1. Identify the pathological syndromes.
2. Formulate a clinical diagnosis and justify it.
3. outline a plan for the examination of the patient.
4. With which pathology should the differential diagnosis be made?
5. Prescribe treatment for the patient with doses and names of drugs.

**Task №7.**

A boy, 5 months old, was admitted to the emergency room in the evening. He had been sick for 2 days. His body temperature increased to 38.5-390C. Vomiting after every feeding, stools up to 15 times a day. Severe symptoms of dehydration, dry skin, dry mucous membranes. No tears when crying. Tachycardia - up to 140 per min. Abdomen not accessible to palpation due to crying. Last urination was in the morning.

In the biochemical blood test: urea - 12 mmol/l, creatinine - 130 µmol/l.

Task:

1. Identify the pathological syndromes.
2. Formulate a clinical diagnosis and justify it.
3. outline a plan for the examination of the patient.
4. With which pathology should the differential diagnosis be made?
5. Prescribe treatment for the patient with the doses and names of the drugs.

**Task №8.**

A 15 year old girl has been admitted to the intensive care unit. Admitted from nephrology department due to anuria. She is receiving hemodialysis treatment (anuria for 5 days). Past medical history shows that the patient was acutely ill, macrohematuria and facial edema appeared. She was admitted to the nephrology department, where edema became widespread, arterial hypertension - up to 160/110 mmHg.

General urine analysis: protein - 4 g/l, erythrocytes - covers the entire field of view.

Daily proteinuria - 3 g/day.

Blood chemistry: total protein - 42 g/l, cholesterol - 8 µmol/l, urea - 35 mmol/l, creatinine - 500 µmol/l. Anuria developed.

Task:

1. Identify the pathological syndromes.
2. Formulate a clinical diagnosis and justify it.
3. outline a plan for the examination of the patient.
4. With which pathology should the differential diagnosis be made?
5. Prescribe treatment for the patient with doses and names of drugs.

**Task №9.**

A 10-year-old boy came to the hospital with complaints of fatigability, weakness, change of urine colour in the form of "meat slop".

The disease began 10 days after the respiratory illness, which had high fever and sore throat. He was treated as an outpatient with folk remedies and paracetamol.

Objectively: pale, dry skin. There was moderate swelling on face and legs. Respiratory and digestive organs had no features. Heart tones were muffled, systolic murmur on the apex and at the V point. The liver was +1 cm from under the rib edge. He urinated 3 times during the day.

What diseases can be suspected? How to prove the etiology of the disease? What laboratory examination does the patient need? Why has the kidney damage developed after 10 days? What is the prognosis of the disease?

Task:

1. Identify the pathological syndromes.
2. Formulate a clinical diagnosis and justify it.
3. outline a plan for the examination of the patient.
4. With which pathology should the differential diagnosis be made?
5. Prescribe treatment for the patient with the doses and names of the drugs.

**Task №10.**

A 7-year-old child is admitted to hospital with a diagnosis of acute glomerulonephritis with nephritic syndrome, period of initial manifestations, without renal dysfunction.

On examination, pale skin, swollen face, decreased amount of urine were noted. On the cardiovascular system, there is some dilation of the heart to the left, systolic murmur. BP - 120/80 mm Hg.

Make an appointment for cito. Carry out differential diagnosis depending on the findings. Prescribe treatment. Explain the purpose of the drugs prescribed. Why is the left heart border enlarged?

Task:

1. Identify the pathological syndromes.
2. Formulate a clinical diagnosis and justify it.
3. outline a plan for the examination of the patient.
4. With which pathology should the differential diagnosis be made?
5. Prescribe treatment for the patient with the doses and names of the drugs.

**Test control:**

1. To assess the functional state of the kidneys, the following are relevant:

1. renal blood flow;
2. glomerular filtration rate;
3. reabsorption;
4. plasma glucose concentration;
5. blood pressure level.

2. Daily proteinuria in the normal range does not exceed:

1. 10 mg;
2. 40 mg;
3. 50 mg; 3;
4. 100 mg; 4;
5. 500 mg; 5.

3. Increased frequency of urination is:
1. enuresis;
2. nycturia;
3. dysuria;
4. pollakiuria.
4. a Nechiporenko urinalysis is: 1:
1. the number of leukocytes, erythrocytes, protein in 1 ml of urine;
2. the number of leucocytes, erythrocytes, cylinders in 1 ml of urine;
3. number of leucocytes, erythrocytes, cylinders excreted with urine in 1 day;
4. number of leucocytes, erythrocytes, protein excreted with urine in 3 hours.
5. The glomerular filtration rate of endogenous creatinine clearance in the normal range is:
1. 40-50 ml/min;
2. 80-120 ml/min;
3. 100-120 ml/min;
4. 140-150 ml/min.
6. Nephrotic syndrome is characterised by:
1. haematuria more than 100,000 per 1l;
2. leucocyturia more than 4,000,000 per litre;
3. proteinuria more than 1 g/l;
4. proteinuria more than 3 g/l;
5. bacteriuria more than 100,000 per 1 ml.
7. State the most frequent route of entry of infection into the bladder:
1. descending;
2. ascending; 2;
3. haematogenous;
4. lymphatic.
8. Which renal function is characterized by the Zimnicki urine test?
1. filtration;
2. reabsorptive; 2;
3. secretory;
4. concentration;
5. excretory.
9. The most common cause of acute renal failure in early childhood is:
1. acute glomerulonephritis;
2. acute pyelonephritis;
3. haemolytic-uremic syndrome;
4. congenital malformations of the urinary system.
10. The most common causative agent of pyelonephritis is:
1. staphylococcus;
2. streptococcus;
3. Klebsiella;
4. Escherichia coli;
5. viruses.

11. Secondary pyelonephritis is characterized by the occurrence of bacterial inflammatory changes of the kidneys in children with:
1. abnormalities of the urinary system organs;
2. urodynamic abnormalities;
3. metabolic nephropathies;
4. previous bacterial or viral infections.
12. Conditions for the development of reflux, urinary stasis in young children are:
1. relatively large size of the pelvis;
2. lobular structure of the kidneys;
3. high positioned bladder;
4. wide ureters;
5. relatively low specific gravity of urine.
13. Factors predisposing to the development of pyelonephritis are:
1. a poor obstetric history in the mother;
2. bad habits of the father;
3. hereditary history of metabolic disorders;
4. abnormal constitution;
5. peculiarities of infant feeding in the first year of life;
6. all of the above.
14. The drug of choice for the treatment of uncomplicated pyelonephritis in an outpatient setting is:
1. gentamicin;
2. 2nd generation cephalosporins;
3. 3rd generation cephalosporins;
4. macrolides;
5. "protected" penicillins.
15. The clinical forms of pyelonephritis in young children are:
1. solteric;
2. hypertensive; 2;
3. pyuric;
4. meningial.
16. Drugs that improve the function of the tubular epithelium include:
1. vitamin B6;
2. vitamins A, E;
3. vitamin D;
4. essenciale;
5. lasix.
17. The nephrotic form of chronic glomerulonephritis is characterized by:
1. age of the child more often under 7 years of age;
2. age of the child more often after 10 years of age;
3. macrohematuria;
4. pronounced proteinuria;
5. leukopenia.
18. Drugs that improve renal blood flow include:
1. eufylline;

2. antiaggregants;
3. heparin;
4. prednisolone;
5. calcium gluconate.

19. The indications for the administration of heparin in glomerulonephritis are:
1. the presence of signs of hypercoagulation;
2. the presence of intrarenal intravascular clotting;
3. pronounced inflammatory changes in blood tests;
4. pronounced edema syndrome;
5. pronounced hyperlipidemia.

20. Indication for renal biopsy is:
1. lack of effect from the ongoing therapy;
2. hereditary nephritis;
3. suspected tuberculosis of the kidneys;
4. haematuria of unclear etiology;
5. all of the above.

Answers: 1-1,2,3; 2-3; 3-4; 4-2; 5-2; 6-4; 7-2; 8-4; 9-3; 10-4; 11-1,2,3; 12-1,4; 13-6; 14-5; 15-4; 16-1,2,4; 17-1,4; 18-1,2,3; 19-1,2,4,5; 20-1,2,4.

**Forms of GSSS performance control:**
1. checking and evaluating the abstract on the given topic;
2. checking and evaluating of correctness of solving situation tasks;
3. test control.

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