

**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  
6th year of the Faculty of foreign students,  
trainees in speciality 1-790101 in the discipline of pediatrics

**Topic: Physiology and pathology of the newborn period. Emergency care for asphyxia.**

Time: 7 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 14<sup>th</sup> of June 2022)

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## LEARNING AND EDUCATIONAL GOALS, MOTIVATION FOR MASTERING THE TOPIC

### Educational objective:

- Formation of students' basic professional competence in the study of the discipline of pediatrics according to the curriculum
- on the basis of the received knowledge to determine the variants of neonatal adaptation to the conditions of extrauterine life, to determine the clinical manifestations of borderline conditions and methods of their correction, to master the diagnostics of asphyxia of the newborn, and also the differential diagnostics with other diseases accompanying the asphyxic syndrome at birth; to teach the methods of primary neonatal resuscitation, to master the diagnostic and differential diagnostics methods for newborn jaundice including GBN, issues and differential diagnostics

### Educational goal:

- Fostering in students a sense of professional responsibility of the future worker of medicine;
- 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 of lectures and practical classes, unexcused absences, tardiness, debts on missed classes).

### Objectives:

As a result of the lesson the student should **know**:

- pathogenesis of the main transient conditions in the neonatal period;
- technique of external examination of the newborn; evaluation of the neurological status of the newborn;
- clinical manifestations of the main pathological CNS syndromes (oppression syndrome, syndrome of increased neuroreflex excitability, stupor, coma, seizure syndrome, intracranial hypertension syndrome, vegetative disorders).
- definition of the concepts of asphyxia and perinatal hypoxia;
- The etiology of asphyxia and high risk factors for the development of antenatal hypoxia and intrapartum fetal asphyxia;
- pathogenesis of asphyxia, parameters of acid-base balance and blood gases in the newborn;
- classification of asphyxia and the clinical picture of asphyxia, depending on the severity;
- basic principles of primary neonatal resuscitation (ABC resuscitation);
- readiness of personnel and equipment for resuscitation care;
- outcomes, complications and prognosis in newborn asphyxia,
- Anatomical and physiological features of the liver, spleen, and hemogram in newborns;
- bilirubin metabolism; biochemical blood parameters in newborns;

- blood types, Rh factor and their antigenic properties;
- etiology, pathogenesis, classification and clinics of GBN;
- Diagnostic methods, principles of treatment of GBN depending on the bilirubin level;
- indications for replacement blood transfusion;
- complications of WBC and WBC;
- clinical manifestations of pneumonia in newborns;
- clinical manifestations of major TORCH infections.

As a result of the class, the student should **be able to**:

- correctly conduct a clinical and neurological examination of the newborn, identify pathological syndromes, prescribe the necessary examination and treatment;
- timely identify borderline conditions in newborns and carry out their correction;
- assess the condition of the newborn on Apgar scale;
- know the technique of upper airway sanitation;
- interpret laboratory data characterizing the BAC and blood gas composition;
- collect the anamnesis in order to identify risk factors of intrauterine or postnatal infection of the newborn;
- examine the newborn to identify signs of infection and entry gates of infection;
- prescribe an examination plan and interpret laboratory data;
- correctly formulate a clinical diagnosis (primary, concomitant, complications);
- prescribe rational treatment;
- to purposefully collect the anamnesis, taking into account risk factors for the development of GBN
- diagnose TBH based on clinical and laboratory data;
- correctly select and justify the method of treatment;

#### **Motivation for mastering the topic:**

- Obtained knowledge and skills during the study of the discipline of neonatology allows to motivate students to improve theoretical and practical knowledge for the timely detection of deviations from the normal course of the early neonatal period, timely detection of fetal hypoxia, predicting the risks of child birth in a state of asphyxia, and providing adequate care in case of birth with low scores on the Apgar scale, prevention of birth with hemolytic disease of newborn, differential

#### **MATERIAL EQUIPMENT**

Tables on the topic of the class, phonendoscopes, a doll-simulator for practicing resuscitation skills of the newborn, laryngoscope, intubation tubes, thematic patients, tasks, test control, a task bank for independent work.

#### **CONTROL QUESTIONS FROM RELATED DISCIPLINES**

1. Anatomical and physiological features of the respiratory system in newborns; mechanism of the first breath.

2. Pathophysiological mechanisms of the main pathological syndromes (hypoxia, acidosis).
3. Mechanisms of pharmacological action of drugs used for emergency care in newborn asphyxia,
4. Bilirubin metabolism and mechanism of jaundice development.
5. Pathophysiological mechanisms of heat regulation and heat exchange in newborns.
6. Blood circulation of the fetus and the newborn.
7. Pathogenesis of inflammation and the role of inflammatory mediators.
8. Antibacterial chemotherapeutic agents; classification, mechanism of action, pharmacodynamics in the newborn.

### **CONTROL QUESTIONS ON THE TOPIC OF THE CLASS**

1. General characteristics of newborn children. Borderline conditions of newborns. 2. Asphyxia, Apgar score. Emergency treatment.
3. Congenital pneumonia. Classification. Etiology. Pathogenesis. Clinical picture. Treatment. Dispensary supervision.
4. Intrauterine infections, mechanisms of development, risk factors. Etiology. Pathogenesis. Clinical picture. Differential diagnostics. Treatment. Dispensary observation.
5. Differential diagnosis of jaundice of newborns. Hemolytic disease of newborns. Emergency treatment of nuclear jaundice.

### **PROCESS OF THE STUDY**

#### **Theoretical part**

At the present stage, a rapid development of neonatology has been registered due to the clear recognition of the leading role of perinatal factors in the etiology and pathogenesis of many chronic human diseases. Despite the high reparative potential in the early postnatal period, many pathological processes in newborns leave a deep mark and manifest themselves in later life, leading to growth imbalances, acquired malformations, being the basis for the formation of chronic immune, neurological, endocrine and other pathologies in children and adults.

After birth the conditions of a child's life change radically, which requires significant restructuring in almost all functional systems of the body.

Boundary conditions, reflecting the process of adaptation to birth, to new living conditions, in a number of situations can take pathological features and become a pathogenic basis for the formation of various pathologies.

Therefore, the study of features of functioning of various organs and systems in the neonatal period, the study of clinical and laboratory manifestations of transient conditions and features of care of the newborn in the maternity hospital is the basis for the prevention of the formation of pathology of the neonatal period.

Asphyxia is one of the main causes of perinatal mortality and high morbidity among newborns. Depending on the severity of asphyxia, there may be critical conditions that require emergency care. According to the International Consensus on Neonatal Resuscitation, at least 10% of children require intensive medical care immediately after birth to make them actively scream, breathe regularly, have good

skin color and muscle tone, heart rate greater than 100 beats per minute. Therefore, intensive care and resuscitation of newborns become an important section of neonatology. It is important to timely diagnose the first manifestations and leading signs of diseases that allow to objectively assess the condition of the sick child, as well as to organize emergency measures for them. Students must be familiar with the rules of medical care for newborns in emergency situations, as well as have information about the drugs and technical means used in the resuscitation and intensive care of newborns.

Respiratory pathology is the most common in the neonatal period. Its causes are varied, but are most often caused by immaturity of alveoli and lung parenchyma. In some situations develop microbial inflammatory lung diseases - pneumonia.

In spite of the broad preventive possibilities of modern medicine, fetal and neonatal GBN remains a very serious problem of perinatology. Spontaneous miscarriages, stillbirths, the birth of children with GBN, the need for repeated blood transfusions and, as an extremely unfavorable variant, the development of bilirubin encephalopathy - are possible if the risk of this pathology is underestimated. Correct and modern diagnosis and adequate therapy of newborns with GBN contributes to the preservation of life of many of them.[10]

### **Practical part**

Students are instructed, attention is paid to the rules of the internal order of the department, sanitary-epidemiological regime in the department of newborns, ethics and deontology in communication with the mothers of newborn children.

During the practical work the student should carry out:

- collection of anamnesis (including antenatal);
- assessing the newborn on the Apgar scale;
- administering necessary resuscitation measures to a newborn depending on the severity of asphyxia;
- Clinical examination of a newborn,
  - Making a preliminary diagnosis and making an examination plan,
- interpretation of the results of laboratory and instrumental methods of examination,
- formulating a final clinical diagnosis,
- making a treatment plan for a newborn who has suffered asphyxia at birth;
- writing prescriptions for medications.

### **Control of assimilation of the topic**

#### **1. Solution of tasks on the topic of the class:**

##### **Task № 1.**

A boy was born to a mother of 33. Second pregnancy, had no peculiarities. Urgent delivery at 40 weeks. Amniotic waters were light. The baby was born with the weight of 4100 g, height 57 cm using a vacuum-extractor. The baby's condition at the first minute is of medium severity, acrocyanosis is observed; breathing is irregular, moaning; heartbeat 110 beats per minute, there is some flexion of limbs, hypotonia, hypodynamia. There is a grimace on suctioning mucus.

1. State and justify the diagnosis. Give an Apgar score at 1 minute.
2. administer emergency care to the newborn.
3. What is the tactic for managing the newborn?

### **Task № 2**

Draw up an algorithm for recognizing newborn pneumonia according to the suggested scheme:

Stages of diagnosis	Signs of the disease theoretically possible with this nosology
Анамнез заболевания Анамнез жизни Объективный осмотр Лабораторные исследования Инструментальные исследования	

### **Task №3.**

A boy from the 2nd pregnancy against the background of pregnancy anemia, I delivery. Mother had a history of 1 medical abortion. Delivery occurred during the 40th week of gestation, Apgar score at the end of the 1st minute was 8 points, at the 5th minute it was 9 points.

Her anthropometric findings at birth were weight 3250 g, height 50 cm, head circumference 35 cm, chest circumference 32 cm.

From the first day she was in the "Mother and Child" ward, breast-fed freely. By the second day the baby weighed 3180 g, by the third day - 3055 g, on the fourth day - 3090 g, on the fifth day - 3130 g, on the sixth day he was discharged home with the weight of 3175 g.

During the first home visit the local pediatrician noticed the satisfactory condition of the newborn, pink color of the skin with patches of microscopic peeling on the abdomen and chest, symmetrical increase of mammary glands, pigmentation of nipples and scrotum, multiple whitish nodules on the wings of nose.

Questions:

1. what conditions of the newborn are we talking about
2. Name them and explain their causes.

## **METHODOLOGICAL RECOMMENDATIONS FOR ORGANIZING AND PERFORMING THE CSR**

**Students use the time allotted for independent work for:**

- working through the topics (issues) assigned for independent study;
- problem solving;
- carrying out 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 organizations;
- making a review of scientific literature on the issues of the class.
- preparation of lectures, discussions with mothers on the prevention of diseases of newborn children and the formation of a healthy lifestyle;
- drawing up situational problems on the topic of the class.

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

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

**The list of tasks of the SIW:**

- study of clinical recommendations (protocols for neonatology).
- Making situational tasks on the topic of the class:
  - borderline conditions of newborns
  - severe asphyxia at birth
  - asphyxia of moderate severity at birth
  - Chlamydia pneumonia in a newborn
  - hemolytic disease of the newborn
- Research paper on the topic of the class.

**METHODOLOGICAL RECOMMENDATIONS ON THE ORGANIZATION AND IMPLEMENTATION OF THE SSR**

**The recommended forms of GSSS organization are:**

1. preparation of essays on proposed topics;
2. solving case problems on the subject of the class.
3. tests on the subject of the class

**List of the GSSS tasks:**

1. prepare an essay on the proposed topic:
  1. The role of intrauterine hypoxia and asphyxia in the formation of perinatal encephalopathy.
  2. Gilbert syndrome.
  3. Kriegler-Nyar syndrome.
  4. Congenital malformations of the respiratory system

**2. Solution of situational problems:**

**Task №1.**

A boy, 4 days old. Body weight at birth was 3800 g. In the afternoon, the child became anxious, the mother went to the neonatology doctor, and the body temperature was measured at 38.8°C. The baby was wrapped in a warm plaid brought from home, according to the mother, it was cool in the room. The child was left under observation in the neonatal ward. Two hours later, the temperature dropped to normal, the baby calmed down. No changes of internal organs were revealed.

1. How can you explain the occurrence of this condition, what is it called?
2. What is your tactic?

3. With what pathological conditions should you make a differential diagnosis? What examinations should be done?

4. Write a prescription for paracetamol for a newborn baby.

**Task №2.**

A boy by a 40-year-old mother with diabetes mellitus. Child from 5 pregnancies, 2 births at 42 weeks. Pregnancy had complications in the 1st trimester: acute respiratory infections; in the 2nd and 3rd trimesters: anemia and gestosis. Vacuum-extraction was used during delivery. Amniotic fluid was green. The boy was born with the body weight 5100 g, height 56 cm, head circumference 36 cm, chest circumference 38 cm. The torso is long with a broad shoulder girdle, short limbs, the face is moon-shaped, with prominent full cheeks. Abundant hair on head, lanugo. Apgar score of 1. Consciousness depressed, eyes closed, pain and tactile sensitivity reduced, no active movements. Total cyanosis. No independent breathing. Heart tones muffled 80 beats per minute, peripheral vascular pulse is thready.

1. State and justify the diagnosis.

Administer emergency treatment.

Determine the indication and technique for indirect cardiac massage. 4.

4. Indications for termination of resuscitation measures.

5. Write a prescription for adrenaline.

**Task №3.**

Girl Z., 14 days old, from a second, normal pregnancy, second term delivery. Apgar score of 8/9. The early neonatal period had no features. She was discharged from the maternity hospital on the fifth day of her life. At home she had contact with a patient with acute respiratory infections. At the age of 10 days, the child had difficult nasal breathing, profuse mucopurulent discharge from nasal passages, temperature rising to 37.4°C. A local pediatrician diagnosed her with acute respiratory infections, prescribed nasal drops. Two days later, the condition rapidly worsened:  $t^{\circ}$  up to 38 °C, the child became restless, refused to breastfeed, started regurgitation, had dyspnea with retraction of compliant parts of the chest. The child was hospitalized. On examination, the child was restless, muscle tone and reflexes of the newborn were reduced, pallor, cyanosis of the nasolabial triangle, acrocyanosis, incomplete foamy discharge on the lips attracted attention. Nasal breathing was difficult. The pharynx is hyperemic. Dyspnea up to 70 per minute, with auxiliary muscles involved. The chest is swollen, there is shortening of the percussion sound in the area of the angle of the scapula on the right, in other areas there is a sound with boxy tinge. Auscultatively, breathing is rigid, in the area of percussion shortening - weakened, crepitating rales are periodically heard there at the height of inhalation. The heart tones were somewhat muffled, Ps 160 per minute. The abdomen was somewhat swollen, the liver protruded 1 cm from under the rib edge, the spleen was not palpable. Clinical blood count: Hb - 174 g/l, Rhe -  $5.2 \cdot 10^{12}/l$ ; CP - 0.9; thromb. -  $268.0 \cdot 10^9/l$ ; Leuk. -  $7.1 \cdot 10^9/l$ , b/l - 10%, c - 61%, e - 1%, l - 19%, m - 9%, SLE - 4 mm/hour. Chest X-ray: on the background of moderate pulmonary bloating and increased vascular and interstitial pattern foci with decreased transparency were revealed.



1. Diagnose the diagnosis.
2. anatomico-physiological features of the respiratory organs in newborns.
3. peculiarities of the course of pneumonias in premature infants.
4. Prescribe treatment.
5. Write a prescription for genferon suppositories for a newborn.

#### **Task №4.**

Newborn baby, day 1, born to a mother with Rh-negative blood. The present pregnancy was the 5th and the 2nd delivery at 34 weeks. Mother's history of obstructed labor and three spontaneous miscarriages at different gestational periods. I registered at the antenatal clinic at 33 weeks. Her examination at 34 weeks of pregnancy revealed 1:64 titer of anti-Rhesus antibodies in mother's blood, US examination revealed enlarged fetal abdomen, double head contour, increased placenta thickness and volume. During cordocentesis the amniotic fluid was drained and labor began. The boy was born with a weight of 2600 g, 40 cm in length. Apgar score of 1. His condition is extremely severe. Severity is due to multiple organ failure. Anasarca. The skin and mucous membranes are pale, there are multiple ecchymoses on the face, torso, extremities. Pale spot symptom for 5 seconds. Depression of consciousness - coma III, arterial hypotension, severe respiratory failure, ascites, pronounced hepatosplenomegaly is pronounced.

1. Diagnose the child.
2. Prescribe clinical investigations for fetal hemolytic disease.
3. Give clinical guidelines for the treatment of fetal hemolytic disease.
4. Carry out the prevention of GBH.
5. Write a prescription for anti-Rhesus immunoglobulin.

#### **3. test control**

1. The hemoglobin content (g/l) immediately after birth in a baby is:
  1. 80-100;
  2. 100-120;
  3. 120-150;
  4. 150-180;
  5. 180-240.
2. Newborn baby 60 seconds after birth: heart rate - 70 bpm, weak irregular breathing, weak flexion of the lower extremities, responds to mucus suction with grimace, acrocyanosis. Indicate the Apgar score:
  1. 2 points;
  2. 10 points;
  3. 5 points;
  4. 9 points;
  5. 1 point.
3. Which of the following is used to treat neonatal apnea:
  1. oxygen therapy, maintenance of constant elevated expiratory pressure;

2. glucocorticoid drugs;
3. beta-adrenomimetics;
4. intravenous glucose.
4. At what Apgar score, after 1 minute of life (according to ICD10) is asphyxia considered severe?
  1. 1;
  2. 2;
  3. 3;
  4. 4;
  5. 5.
5. Jaundice in hemolytic disease of the newborn appears:
  1. on day 1-2 of life;
  2. on the 4th day of life;
  3. on days 4-6 of life;
  4. after day 7 of life.
6. Indications for sanitation of the tracheobronchial tree in newborns born in asphyxia are:
  1. transient apnea;
  2. aspiration syndrome;
  3. anesthesia depression;
  4. hyaline membrane disease.
7. In pneumonia, a major factor in the occurrence of hypoxia is:
  1. fever;
  2. shallow breathing;
  3. increased metabolism;
  4. tachycardia.
8. The transient loss of initial body weight of a newborn is:
  1. 5-8%;
  2. 8-12%;
  3. more than 12%.
9. The following complications may occur in newborns with prolonged inhalation of high concentrations of oxygen:
  1. pneumothorax;
  2. apnea;
  3. bronchopulmonary dysplasia;
  4. pneumonia.
10. State the timing of the disappearance of physiologic jaundice in newborns:
  1. up to 4 days of life;
  2. up to 10 days of life;
  3. before 14 days of life;
  4. before the end of the neonatal period.

11. Indicate the depth of insertion of an umbilical catheter in a baby weighing more than 3000 g:

1. 10-12 cm;

2. 5-6 cm;

3. 8-9 cm;

4. The standing depth of the catheter will be individual for each child and depends on their height.

Answers: 1 - 5; 2 - 3; 3 - 1; 4 - 1, 2, 3; 5 - 1,3,4; 6 - 2; 7 - 2; 8 - 1; 9 -3, 10-2, 11-4.

### **Forms of control of GSSS performance:**

1. checking and evaluating the abstract on the given topic;

2. checking and evaluating the correctness of solving situational tasks;

3. test control.

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#### ELECTRONIC DATABASES

1. Консультант студента. Электронная библиотека медицинского вуза. Расширенный пакет = Student consultant. Electronic library of medical high school. Extended package [Электронный ресурс] / Издательская группа «ГЭОТАР-Медиа», ООО «ИПУЗ». – Режим доступа: <http://www.studmedlib.ru> – Дата доступа: 28.05.2022. (Включает: «Электронную библиотеку медицинского ВУЗа»; ГЭОТАР-Медиа. Премиум комплект; Книги из комплекта «Консультант врача»).

2. Scopus [Electronic resource] / Elsevier. – Mode of access: <https://scopus.com> – Date of access: 28.05.2022.

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