

Ministry of Health of Ukraine
O.O. Bogomolets National Medical University

GUIDELINES
to practical classes for students

Elective discipline: Basics of neonatology

Field of knowledge: 22 "Health care"

Specialty: 222 "Medicine", 228 "Pediatrics"

Department of Pediatrics No. 2

Approved at the meeting of the department
from protocol № 1 dated 28.08.2023

Reviewed and approved by: Center for Pediatric Disciplines
from protocol № 1 dated 28.08.2023

Lesson topic : Hematological problems of the newborn period.

Competencies :

- carry out an assessment of the general condition of a newborn child by making a reasoned decision according to existing algorithms and standard schemes, observing the relevant ethical and legal norms;
- highlight and identify leading clinical symptoms and syndromes (anemia, polycythemic syndrome);
- according to standard methods, using the previous data of the patient's history, the data of the patient's examination, knowledge about the person, his organs and systems, establish a preliminary clinical diagnosis of the disease (hemolytic, hypoplastic anemia or anemia due to blood loss, polycythemic syndrome);
- collect obstetric anamnesis, evaluate the physical development of a premature baby, the state of organs and systems of the body, based on the results of laboratory and instrumental studies, evaluate information about the diagnosis (general analysis of blood, urine, blood proteins, blood glucose, bilirubin and its fractions, electrolytes, radiography thoracic and abdominal organs, neurosonography);
- establish a final clinical diagnosis by making a reasoned decision and analyzing the obtained objective data of clinical, additional examination, carrying out differential diagnosis, observing the relevant ethical and legal norms;
- assess and monitor the child's development, provide recommendations on feeding and nutritional features;
- to determine tactics and provide emergency medical care in emergency situations (severe anemia and polycythemia) in accordance with existing clinical protocols and treatment standards;
- perform medical manipulations (perform indirect heart massage, artificial respiration, install nasogastric and orogastric tubes, restore airway patency).

Goal:

Formation of professional competences; achievement of program learning outcomes in the process of discussing the topic and performing independent work on the topic; mastering practical skills and methods of providing emergency care.

Equipment: newborn baby manikin, ventilator and oxygen therapy kit, resuscitation bag and face mask size "1", equipment for airway sanitation (rubber pears), umbilical vein catheterization kit (scalpel, ligature, tweezers, umbilical catheter, syringe for injections), neonatal stethoscope, pulse oximeter, diapers, disposable gloves, antiseptic for hand treatment.

Lesson plan and organizational structure

The name of the stage	Description of the stage	Levels of assimilation	Time
Preparatory	<i>Organizational issues</i> <i>Learning motivation:</i> After birth, all babies experience a gradual decrease in hemoglobin, which leads to varying degrees of anemia. During the first weeks of life, the concentration of hemoglobin decreases significantly due to a decrease in erythropoiesis due to an insufficient level of erythropoietin, as well as due to a decrease in the life expectancy of erythrocytes during this period. Although all newborns develop physiologic anemia, premature infants experience a greater degree of anemia that results from a combination of physiologic and pathologic factors. Iatrogenic blood loss due to phlebotomy for laboratory testing is an important cause of anemia of prematurity. Because low-birth-weight and premature babies usually require close monitoring, they suffer from a large amount of blood loss. Because of the complexity of patients in intensive care units (prematurity, infections, other diseases, ventilatory support) and the unavailability of certain laboratory tests, determining the cause of neonatal anemia can sometimes be a challenge for clinicians. Neonatal polycythemia is usually a normal fetal adaptation to hypoxemia. At the same time, the pathological polycythemic syndrome creates a risk of hyperviscosity, microcirculation hypoperfusion and, in the long term, polysystem organ dysfunction. <i>Control of the initial level of knowledge (test control and oral survey):</i> 1. The main reason for the development of anemia in premature babies in the neonatal period: A. Iron deficiency B. Increased hemolysis of erythrocytes B. Hemodilution G. Reduction of erythropoietin production D. Early clamping of the umbilical cord after birth	Introductory Reproductive	25 min

	2. What changes in the morphology of erythrocytes are characteristic of acute blood loss? A. Microcytosis B. Normocytosis B. Schizocytosis G. Spherocytosis D. Elliptocytosis 3. What indicators are characteristic of hemolytic anemia? A. Normal values of MSH, MCV, low - Hb, RBC B. High values of MSH, MCV, low - Hb, RBC B. High values of MSH, MCV, high - Hb, RBC D. Low values of MSH, MCV, low - Hb, RBC D. Low values of MSH, MCV, Hb, normal - RBC 4. What pathogens are associated with a decrease in erythrocyte production? A. Chlamydia B. Staphylococcus B. Listeria G. Human immunodeficiency virus D. Parvovirus B19 5. Risk factor of polycythemic syndrome in a newborn child: A. Feto-maternal transfusion B. Early clamping of the umbilical cord B. Placental insufficiency during pregnancy D. Prematurity D. Intrauterine infection		
Basic	<i>Performance of practical tasks :</i> - demonstration of a thematic patient in the neonatal intensive care unit; - study of obstetric anamnesis; - evaluation of the results of laboratory and instrumental examination methods; - on the basis of obstetric anamnesis, examination data and results of laboratory and instrumental studies, establishment of a preliminary clinical diagnosis; - determination of factors and pathogenetic mechanisms of disease development; - appointment of treatment (emergency measures, medical treatment, particularities of care, feeding);	Introductory Reconstructive Creative Reconstructive	1 hour 45 minutes

	- determination of disease prevention measures; - familiarization with the operation of the equipment - incubators, resuscitation table, phototherapy lamp, radiant heat lamp, ventilators; - practicing medical manipulations using a dummy of a newborn child.		
Final	<i>Control of the final level of training (situational problems):</i> 1. A boy from the second pregnancy, during which the mother was diagnosed with mild anemia, the second delivery at 38 weeks' gestation, was born by caesarean section due to fetal distress with a body weight 3500 g and a height 52 cm. During the examination the child has pallor of the skin, muscle hypotonia and hyporeflexia, RR 60 per minute, auscultatory breathing puerile, heart rate 160 per minute, heart sounds are rhythmic, no murmur is heard, abdomen is soft, liver +2 cm, spleen is not palpable. The blood group of the mother and child is (I), Rhesus (+), the level of total bilirubin in the umbilical cord blood is 35 $\mu\text{mol/l}$ due to the indirect fraction. Laboratory indicators: Hb - 130 g/l, erythrocytes - 4.0×10^{12}, Ht 0.50, reticulocytes - 15‰. Determine the type of anemia, possible causes, tactics of child care. Answer standard: Given the presence of reticulocytosis and the absence of signs of increased hemolysis, the most likely cause of anemia is feto-maternal transfusion. In order to confirm the diagnosis, it is advisable to prescribe the Kleinhauer-Bethke test. Monitor saturation and resolve issues regarding the need for oxygen therapy. 2. A girl from her first pregnancy, the course of which was complicated by late gestosis, fetoplacental insufficiency, delayed intrauterine development of the fetus, the first delivery at a gestation period of 37 weeks, was born with a body weight of 1850.0 g, a height of 45 cm. Apgar score 7-7 points . During the examination, the child has an erythematous skin tone, muscle hypotonia, hyporeflexia, BP 70 per minute, auscultatory – puerile, heart rate 150 per minute, rhythmic tones, no murmur, soft abdomen, liver +1 cm, spleen not is palpated Laboratory indicators:	Creative	30 min

	Hb - 230 g/l, erythrocytes - 6.0×10^{12}, Ht 0.70. Determine the cause of polycythemic syndrome, possible consequences, management tactics. Answer standard: The cause of polycythemic syndrome is internal hypoxia (inhibition of erythropoiesis) as a result of pregnancy hemoziosis and placental insufficiency with the development of internal hypotrophy. Можливі наслідки: легенева гіпертензія з розвитком синдрому ПФК (персистуючого фетального кровообігу), підвищення системного артеріального тиску, венозний застій в легенях, метаболічні порушення (гіпербілірубінемія, гіпокальціємія, гіпомагніємія, гіпоглікемія), внутрішньочерепний крововилив, судоми, апное, тромбоз ниркових вен. Examination: Ht control every 4-6 hours during the day, general analysis of blood, platelets, blood gases, blood sugar, bilirubin, urea, electrolytes, lung angiography. Observation, control of saturation, in case of decrease - oxygen therapy, correction of metabolic disorders, conservative treatment by increasing fluid intake <i>General evaluation of the student's educational activity</i>		
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Recommended reading :

Basic:

1. Neonatology: a national textbook: in 2 volumes / edited by by Professor E. Ye. Shunko - K., 2015. - Volume 1. - pp. 784-827.
2. Neonatology: textbook: in 3 volumes / T.K. Znamenska, Y.G. Antipkin, M.L. Aryaev, etc.; under the editorship T.K. Znamenskaya. – Lviv: T.V. Marchenko Publisher, 2020. – Volume 3. - pp. 118-127.

Additional:

1. Basics of pediatrics according to Nelson: in 2 volumes. Volume 1 / Karen J. Marcdante, Robert M. Kligman; translation of the 8th Eng. edition. Scientific editors of the translation V.S. Berezenko, T.V. Rest Kyiv: VSV "Medicine", 2019. T1. - pp. 259-260.

2. Nelson Textbook of Pediatrics, Volume 1 of 5 volumes, 21th Edition, 2019 by Robert M. Kliegman, Nathan J. Blum, Samir S. Shah, Joseph W. ST GEME III, Robert C. Tasker, Karen M. Wilson, Richard E. Behrman, pp. 961-974.

Information resources:

1. <https://www.intechopen.com/chapters/78720>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6962272/>

Questions for student self-preparation for practical training:

1. Erythropoiesis in the fetus.
2. Causes of physiological anemia in a newborn.
3. Anemia in prematurely born children.
4. Factors of blood loss in newborns.
5. Causes of hemolysis of erythrocytes in newborns.
6. Hypoplastic anemia in newborns.
7. Diagnosis of anemia.
8. Principles of anemia treatment.
9. Causes of polycythemic syndrome in newborns.
10. Principles of treatment of newborns with polycythemic syndrome.

Methodical development is completed

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