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** : Neonatal metabolic problems.

**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;

- distinguish and identify manifestations of hypoglycemia, hyperglycemia, hypo- and hypernatremia, hypo- and hyperkalemia;

- according to standard methods, using the previous data of the patient's history, the data of the patient's examination, establish a preliminary clinical diagnosis of the disease;

- collect obstetric anamnesis, evaluate the physical development of the newborn child, the state of organs and systems of the body, based on the results of laboratory and instrumental studies, evaluate information regarding the diagnosis (general analysis of blood, urine, blood proteins, blood glucose, bilirubin and its fractions, electrolytes);

- 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;

- determine tactics and provide emergency medical care in emergency situations associated with glucose metabolism disorders and electrolyte disorders 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 |
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| **Preparatory** | *Organizational issues* | | 25 min |

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| | *Learning motivation:*<br>In neonatological practice, impaired glucose metabolism in children is a very urgent problem. According to statistical data, symptomatic hypoglycemia occurs in ~ 20% of full-term newborns during the first hours after birth, hypoglycemia with clinical symptoms - in < 1% of full-term newborns, in ~ 5% of preterm infants, in 15% of newborns from mothers with diabetes. Since glucose is the main substrate of brain activity, uncorrected hypoglycemia in a timely manner can lead to irreversible damage to neurons with further development of persistent neurological complications or death of the child. At the same time, hyperglycemia is detected in ~70% of newborns with weight < 1500.0, severe perinatal pathology, who receive infusion therapy, which is also an unfavorable sign regarding the prognosis. Violations of electrolyte metabolism, primarily of sodium and potassium, can be a sign of a serious pathology that requires immediate diagnosis and correction in order to prevent the development of complications.<br>*Control of the initial level of knowledge* ( *test control and oral survey* ):<br>1. Causes of persistent hypoglycemia in newborns:<br>A. Diabetic fetopathy<br>B. Asphyxia at birth<br>B. Neonatal sepsis<br>G. Hypothermia,<br>**D. Congenital metabolic defects (galactosemia, phenylketonemia, tyrosinemia** )<br>2. Clinical signs of hyperglycemia:<br>**A. Dehydration**<br>B. Lethargy<br>V. Apnea<br>G. Cyanosis<br>D. Tremor of limbs<br>3. Changes on the ECG during hypokalemia:<br>A. High tooth T<br>B. Flat tooth R<br>**B. Negative or flat T wave**<br>G. Wide QRS complex<br>D. Sinus bradycardia<br>4. What method is used in the treatment of hyperkalemia, if the level of K+ does not decrease after standard measures? | Introductory<br><br>Reproductive | |

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| | A. Prescribe lasix after increasing the vascular volume<br>B. Correct hypomagnesemia<br>B. Correct hypocalcemia<br>**G. Replacement transfusion of erythrocytes**<br>D. Correct acidosis<br>5. The main functions of sodium in the body:<br>A. A significant amount is intracellular<br>B. Suppresses insulin synthesis<br>**B. Controls the osmotic balance between extracellular and intracellular fluid**<br>D. Regulates heart rate<br>D. Support of adequate muscle contractions | | |
| **Basic** | *Performance of practical tasks* :<br>- demonstration of a thematic patient in the neonatal intensive care unit;<br>- study of obstetric anamnesis;<br>- evaluation of the results of laboratory and instrumental examination methods;<br>- on the basis of obstetric anamnesis, examination data and results of laboratory and instrumental studies , establishment of a preliminary clinical diagnosis;<br>- determination of factors and pathogenetic mechanisms of disease development;<br>- appointment of treatment (emergency measures, medical treatment, particularities of care, feeding);<br>- determination of disease prevention measures;<br>- familiarization with the operation of the equipment - incubators, resuscitation table, phototherapy lamp, radiant heat lamp, ventilators;<br>- practicing medical manipulations using a dummy of a newborn child. | Introductory<br><br>Reconstructive<br><br>Creative<br><br>Reproductive<br><br>Reconstructive | 1 hour 45 minutes |
| **Final** | *Control of the final level of training* ( *situational problems* ):<br>1. A premature boy was born at a gestation period 30 weeks with a weight 1400 g. On the fifth day of life, he became lethargic, had apnea attacks. The level of serum Na+ is 119 mlmol/l. Correct hyponatremia in the child.<br>Answer standard:<br>1) Calculation of the need for Na+:<br>-(125-119) x 0.6 x 1.4 = 5 mmol Na+;<br>-5 mmol Na+ corresponds to 10 ml of 3% NaCl solution OR 3 ml of 10% NaCl solution; | Creative | 30 min |

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| | - the calculated amount should be entered in 2 hours.<br>2) Introduction:<br>- the child's fluid requirement for the 5th day is 100 ml/kg: 1.4 x 100 ml = 140 ml per day (5.8 ml per hour);<br>-3 ml of 10% NaCl solution + 9 ml of 5% glucose solution to be introduced within 2 hours.<br>2. A full-term boy was born at 39 weeks. Currently, he is 7 days old and weighs 4,000.0 grams. He became lethargic and had bloating and vomiting. The serum K+ level is 3.0 mmol/l.<br>Answer standard:<br>1) Calculation of the need for K+:<br>-(4.5 mmol/l - 3.0 mmol/l) x 4.0 x 0.35 = 2.1 mmol;<br>- physiological need: 2 mmol/l x 4.0 = 8 mmol;<br>- the total amount of K+ is 8 + 2.1 = 10.1 mmol/day;<br>-1 mmol of K - 1 ml of 7.5% KCl;<br>-10.1 mmol K = 10.1 ml of 7.5% KCl.<br>2) Introduction:<br>- dilute 10.1 ml of 7.5% KCl solution in 100 ml of 5% - 10% glucose to obtain a 1% solution;<br>- the child's need is 100 ml/kg - 400 ml per day (16 ml/h);<br>- inject the prepared solution within 7 hours.<br><br>*General evaluation of the student's educational activity* | | |

**Recommended reading** :

*Basic:*

1. Neonatology: a national textbook: in 2 volumes / edited by by Professor E.E.Shunko - K., 2015. - Volume 2. - pp. 405-419.

2. Unified clinical protocol of secondary (specialized) and tertiary (highly specialized) medical care "Parenteral nutrition of newborn children", approved by the Order of the Ministry of Health of Ukraine dated April 18, 2022 No. 650 http://journal.medlib.dp.gov.ua/wpcontent /uploads/2022/05/N_650_18_04_2022_dod.pdf

*Additional:*

1. 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, P.912, 925-928.

**Questions for student self-preparation for practical training:**

1. Physiological features of glucose metabolism in newborns.
2. Hypoglycemia - causes, clinical signs, prevention, treatment.
3. Hyperglycemia - causes, clinical signs, treatment.
4. Hypernatremia - causes, clinical signs, treatment.
5. Hyponatremia - causes, clinical signs, treatment.
6. Hyperkalemia - causes, clinical signs, treatment.
7. Hypocalcemia - causes, clinical signs, treatment.

**Methodical development is completed**

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