MINISTRY OF HEALTH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

Departments of Pediatrics №2

CONFIRMED by

Vice-rector for research and educational work

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METHODOLOGICAL RECOMMENDATIONS ON PRACTICAL CLASSES FOR STUDENTS

International Medical Faculty, course 6

Educational discipline "**PEDIATRICS**"

Approved
at the meeting of the department of Pediatrics №2
Protocol No. 11 dated 28/08/2022

Head of the department of Pediatrics №2 _____ Tetiana STOIEVA
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1. Topic: № 4

Differential diagnosis of jaundice in newborns. Clinical variants and complications of the course of jaundice in newborns at the polyclinic stage of observation.

Differential diagnosis of jaundice in newborns. Data of laboratory and instrumental studies in the diagnosis of hemolytic, conjugation, parenchymatous and mechanical jaundice in newborns. Differential diagnosis of jaundice in newborns.

Differential diagnosis of jaundice in newborns. Tactics of management of newborns with manifestations of jaundice in the ward in the context of IMCI.

2. Relevance of the topic.

Of all diseases of the nervous system in children, 2/3 have their roots in the perinatal period. The rapid development of perinatology in the last two decades has made it possible to study the formation of various functional systems of the fetus and newborn. A special place is occupied by the study of the central nervous system, the development of which begins in early ontogenesis, lengthens the entire pregnancy and ends after the birth of the child.

In almost all newborns, a temporary increase in the level of bilirubin in the blood serum is total serum bilirubin erved after birth, but only half of them realize visible jaundice. In most cases, jaundice manifests itself in the first 3 days of a child's life, proceeds favorably and is regarded as a "physiological state", since most often it is caused by the peculiarities of the child's development and metabolism during this period of life. However, given the potential toxicity of indirect bilirubin and since neonatal jaundice can be a symptom of other diseases, monitoring should be carried out to identify conditions that require additional intervention in a timely manner.

3. Lesson objectives

3.1. Common goals

To acquaint students with the classification of jaundice in newborns, the algorithm for the differential diagnosis of neonatal jaundice, the concept of "physiological" and "dangerous" jaundice.

3.2. Educational purposes

Students are obliged by their appearance, culture of speech and communication with a sick child and parents, medical personnel, to show that deontology is an integral part of the moral and ethical standards of the medical profession.

3.3. Specific goals

-to know:

1. Prevalence of all types of jaundice.
2. Risk factors for the development of diseases.
3. Modern classification.
4. The clinical picture of diseases.
5. Comprehensive treatment.

3.4. Based on theoretical knowledge of the topic:

-to be able to:

1. Take anamnesis.
2. To identify a history of factors contributing to the onset of jaundice.
3. Conduct a clinical examination of the patient.
4. Carry out the differential diagnosis and formulate a clinical diagnosis according to the classification.
5. Evaluate the results of laboratory diagnostic methods.

6. Give recommendations to parents on measures of rehabilitation and prevention of jaundice.

4. Interdisciplinary integration

№	Disciplines	To know	To be able to do
1.	Previous disciplines		
	1. Anatomy 2. Normal physiology 3. Pathological anatomy and physiology 4. Biochemistry 5. Propedeutics of childhood diseases	Anatomical and physiological features of bilirubin metabolism during the neonatal period, the method of clinical examination and assessment of jaundice.	Determine the features, causes and mechanisms of development of jaundice in newborns.
2.	The following disciplines		
	1. Pediatrics	Methods of diagnosis and differential diagnosis, assessment of the child's vital functions, calculation of the hourly increase in bilirubin, determination of indications for phototherapy and replacement blood transfusion surgery, followed by monitoring.	To be able to make differential diagnosis of the main symptoms of jaundice and pathology of the nervous system.
	2. Differential diagnosis of neonatal jaundice.	Etiopathogenesis, diagnostic criteria, basic principles of treatment, interpretation of clinical and paraclinical data.	Conduct differential diagnostics. Prescribe treatment, registration of medical documentation.

5. Lesson content

Neonatal jaundice (neonatal jaundice) develops in 60% of term infants and 80% in premature infants. In almost all newborns, a temporary increase in the level of bilirubin in the blood serum is total serum bilirubin erved after birth, but only half of them realize visible jaundice. Hyperbilirubinemia occurs when there is an imbalance between bilirubin production, conjugation, and elimination. As a result of damage to red blood cells and hemoglobin, unconjugated bilirubin appears to accumulate in the blood. Unconjugated bilirubin binds to albumin and is transported to the liver, where it is converted to conjugated bilirubin. Conjugated bilirubin is soluble in water, and therefore has the ability to be excreted in urine and feces. Unconjugated bilirubin dissolves in lipids and can cross the blood-brain barrier.

In most cases, jaundice manifests itself in the first 3 days of a child's life, proceeds favorably and is regarded as a "physiological state", since most often it is caused by the peculiarities of the child's development and metabolism during this period of life. Minor jaundice may persist during the first week of life, but usually disappears within 10 days (term babies) or three weeks of life (premature babies) without any identifiable cause. However, given the potential toxicity of indirect bilirubin and since neonatal jaundice can be a symptom of other diseases, monitoring should be carried out to identify conditions that require additional intervention in a timely manner.

Evaluation of a child with jaundice is necessary to determine the underlying cause of jaundice in any of the following cases:
- Early start with high peak levels.

- increased level of conjugated bilirubin.
- persists for a longer time, taking into account the duration of physiological jaundice.
- the child has other clinical diseases or disorders.

Maternal risk factors for jaundice in a newborn

Factors	Comments
Blood type	Blood group O (I)
Rh - negative factor	Anti-erythrocyte antibodies - D, C, c, E, e and K, etc.
Jaundice in previous children	Need for phototherapy or other treatment
Diabetes	High erythrocyte mass in a child with uncontrolled diabetes mellitus in the mother (of any type).
Genetic	East Asia Mediterranean Complicated hereditary history of hemolytic disorders (eg, G6PD deficiency, hereditary spherocytosis)

Risk factors for the newborn

Factors	Comments
Feeding	Breast milk: Deficiency of β-glucuronidase may play a role in disrupting the binding of bilirubin to glucuronic acid, thereby making it available for reabsorption. Lipoprotein lipase (a water-soluble enzyme) and fatty acids in breast milk can inhibit normal bilirubin metabolism. Factors that delay physiological colonization of the intestine cause the accumulation of a high concentration of bilirubin in the intestine. Insufficient amount of breast milk (possibly with a delay in its production) or intake of formula, which leads to dehydration and increased hepatic circulation.
Hematological	Factors causing hemolysis (immune or non-immune). Polycythemia. Hematoma or bruising.
Gastrointestinal	Bowel total serum bilirubin truction.
Other	Infections. Premature birth. Male.

Etiologically, jaundice is divided into:

1) suprahepatic (hemolytic) - free (unconjugated) hyperbilirubinemia, due to:

a) excessive production of bilirubin as a result of external or intravascular hemolysis. Causes: congenital hemolytic anemias, immunological hemolysis, damage to erythrocytes (artificial heart valve, march hemoglobinuria, thrombocytopenic purpura, hemolytic uremic syndrome, DIC), infection (sepsis, malaria, toxoplasmosis), severe burns, hypersplenism.

b) violation of the conjugation of bilirubin with glucuronic acid. Causes: Gilbert's syndrome, Crigler-Nayard syndrome.

2) **hepatic (parenchymal)** - mixed hyperbilirubinemia, due to liver damage. Causes: liver cirrhosis, infection (viral hepatitis, viral infection without hepatitis with extensive necrosis of hepatocytes [yellow fever and other hemorrhagic fevers], bacterial infections [leptospirosis, congenital and secondary syphilis], sepsis, liver abscesses), autoimmune hepatitis , drug-induced liver damage, toxic liver damage (acute alcoholic hepatitis, biological toxins [fungi, plant

alkaloids] or inorganic [carbon tetrachloride, alcohols]), liver tumors (primary and metastatic), lymphoproliferative neoplasms (lymphomas), vascular disorders (Budd's syndrome) Chiari malformation, heart failure), jaundice of pregnancy.

3) **extrahepatic** (syn. Total serum bilirubin tructive jaundice, extrahepatic cholestasis, total serum bilirubin tructive) - conjugated hyperbilirubinemia dominates; the result of a violation of the physiological outflow of bile. Causes: cholelithiasis, pancreatic cancer, extrahepatic cholangitis, sclerosing cholangitis, primary biliary tract cancer.

Neonatal jaundice (jaundice of newborns) is the appearance of a visible yellow color of the skin, sclera and / or mucous membranes of the child due to an increase in the level of bilirubin in the blood of the newborn.

Classification:
1. Physiological (up to 90% of neonatal jaundice).
2. Pathological (10% of all jaundice).
3. By origin: hereditary, non-hereditary, congenital and acquired.
4. According to laboratory data: hyperbilirubinemia with a predominance of NB and hyperbilirubinemia with a predominance of PB.

The most informative is the **pathogenetic classification:**

Congenital	Acquired
Increased production of bilirubin	
1. Erythrocytic membranopathies (microspherocytosis, elliptocytosis, etc.). 2. Erythrocytic fermentopathies (glucose-6-phosphate dehydrogenase, pyruvate kinase, hexokinase, congenital erythropoietic porphyria, etc.) 3. Hemoglobinopathies - structural defects (sickle cell anemia, M-hemoglobinemia, etc.) and hemoglobin synthesis (α, β, E β, γ-thalassemia), heme (congenital erythroporphyria)	1. Hemolytic disease of the newborn. 2. Sequestration of blood - hemorrhages (cephalohematoma, under the aponeurosis, in the brain, internal organs, ecchymosis, etc.), hemangiomas. 3. Swallowed blood syndrome. 4. Polycythemia. 5. Medicinal hemolysis (vitamin K, penicillin, sulfonamides; maternal oxytocin, etc.). 6. Increased enterohepathogenic circulation of bilirubin (pyloric stenosis, breastfeeding jaundice, intestinal total serum bilirubin truction, etc.). 7. Vitamin E-deficiency anemia and neonatal pycnocytosis. 8. Immunopathological diseases of the mother: autoimmune hemolytic anemia, lupus erythematosus
Decreased bilirubin clearance (hepatic jaundice)	
1. Defect in the capture of bilirubin by hepatocytes (Gilbert's disease). 2. Defects of bilirubin conjugation (Crigler-Nayyar syndromes of the 1st and 2nd type, Lucei-Driscoll). 3. Defects in the excretion of bilirubin from the hepatocyte (Dubin-Johnson, Rotor syndromes).	1. Deficiency of hormones (hypothyroidism, hypopituitarism) or their excess (jaundice of breast milk). 2. Energy and water deprivation (breastfeeding jaundice). 3. Infectious hepatitis. 4. Toxic hepatitis (medicinal, sepsis, poisoning). 5. Long-term total parenteral nutrition

4. Symptomatic in hypothyroidism, galactosemia, fructosemia, hypermethioninemia, hyperammonemia, etc.	
Total serum bilirubin tructive (mechanical) jaundice (total serum bilirubin tructive pediatric cholangiopathy)	
1. Atresia or hypoplasia of the extrahepatic biliary tract of the fetal type - syndromic anomalies of the biliary tract in combination with other malformations (Alagil's syndrome, or "Norwegian" cholestasis). 2. Familial, non-syndromic cholestasis (with lymphedema "North American Indians McElfresh). 3. Symptomatic cholestasis in hereditary diseases - cystic fibrosis, alpha-1-antitrypsin deficiency, hemochromatosis, histiocytosis X 4. Cholestasis with dilatation of the intrahepatic tract (Caroli disease, polycystic disease, congenital liver fibrosis)	1. Atresia or hypoplasia of the extrahepatic biliary tract due to perinatal hepatitis. 2. Intrahepatic atresia and hypoplasia of the biliary tract in perinatal hepatitis of various etiologies, as well as primary biliary cirrhosis, primary sclerosing cholangitis, graft versus host reactions. 3. Stenosis of the common bile duct or its cyst. 4. Choledocholithiasis. 5. Compression by tumors and other formations. 6. Syndrome of thickening of bile, syndrome of "bile plug". 7. Transient cholestasis in the structure of toxic hepatitis and multiple organ failure in SIRS.

Jaundice of mixed genesis with a predominance of one of the components:
1. Transient jaundice of newborns.
2. Neonatal jaundice of prematurity.
3. Sepsis.
4. Intrauterine infections (cytomegalovirus, toxoplasmosis, listeriosis, etc.)

Clinical classification of neonatal jaundice by time of onset:

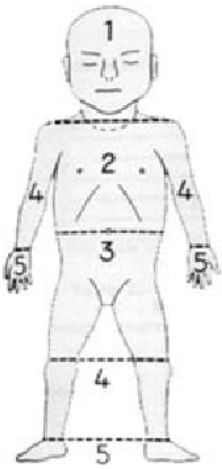
№	Types of jaundice	Time of appearance	Characteristic
1.	Early jaundice	appears before 36 hours of a child's life	Jaundice that appears in **the first 24 hours** is always a sign of pathology. Phototherapy should be started immediately and bilirubin levels should be measured at the same time.
2.	"Physiological" jaundice	after 36 hours of life	The increase in the level of total bilirubin is not higher than 205 micromol / L.
3.	Complicated "physiological" jaundice	after 36 hours of life	Physiological jaundice, the course of which may be accompanied by a change in the child's condition. Serious signs of danger are the spread of jaundice to zone 4 on the second day of life and to zone 5 (on the Kramer scale) after 48 hours.

4.	Prolonged (lingering) jaundice	full-term newborn - after 14 days of life premature - after 21 days of life	
5.	Late jaundice	after 7 days of life of a newborn	Always requires a thorough examination

In rare cases, the course of neonatal jaundice can be complicated by the development of bilirubin encephalopathy, which is manifested by an acute lesion of the central nervous system. This can lead to irreversible chronic damage to the central nervous system - kernicterus.

Examination of a newborn with jaundice:

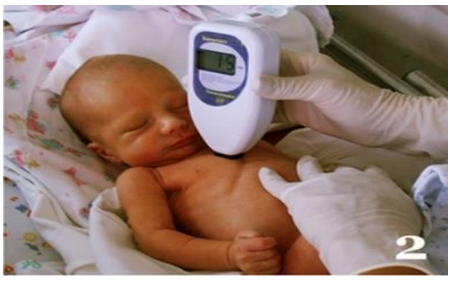
1. Inspection for the presence of icteric staining of the skin should be carried out when the child is completely undressed, provided there is sufficient (optimally, daylight) lighting. To do this, lightly pressing the child's skin to the level of the subcutaneous tissue is carried out.



Assess and Track Progression of Newborn Jaundice

Date:	Time:		Age (hrs)	
Dermal Zone	Intensity		TcB mg/dL	Risk status
	Mild (lemon)	Deep (orange)		
1				Low
2				Intermediate
3				
4				High
5				

2. The prevalence of icteric skin coloration. To assess the stages of the appearance of jaundice and the correlation with the level of bilirubin in the blood serum, it is advisable to use the modified Cramer scale (Fig. 1). Jaundice first appears on the face and then spreads towards the baby's extremities, reflecting the increase in serum bilirubin levels. Bilirubin level indications are shown next to the figure. Coloring of the child's skin in zones 3-5 requires the mandatory determination of total serum bilirubin or TCB.



3. Determination of the level of bilirubin of the skin by the method of transcutaneous bilirubinometry (TCB).
4. Determination of total serum bilirubin.

Criteria for "dangerous" neonatal jaundice (WHO, 2003)			
Child's age (hours)	Localization	Conclusion	Tactics
24	**Any**	**"Dangerous" jaundice**	Start phototherapy immediately, without waiting for the result of the total serum bilirubin.
24-48	**Limbs**		
> 48	**Feet, hands**		

The clinical condition of a newborn with the onset of jaundice. Pay particular attention to:

1. Degree of child's adequacy, activity of reflexes.
2. Adequacy of breastfeeding, which should occur at least 8 times a day.
3. Condition of skin turgor and moisture of mucous membranes.
4. The size of the liver and spleen.
5. Frequency of urination and the nature of urine.

According to the IMCI strategy, clinicians should ensure that all newborns are regularly monitored for the development of jaundice and measured in the following cases:
- In all infants, if jaundice occurs within the first 24 hours of life.
- All babies have yellow palms and soles, regardless of age.

Jaundice in the IMCI strategy is assessed according to the following criteria:
- time of appearance;
- localization;
- yellowness of the palms and feet.

Symptoms of acute lesions of the central nervous system (bilirubin encephalopathy):
1. The appearance of lethargy, drowsiness, lethargy and suppression of the sucking reflex in the early stages of damage to the central nervous system.
2. Increased irritability, muscle hypertension, high-pitched cry, possibly an increase in temperature in a later period.
3. At irreversible stages, the child has opisthotonus, convulsions, apnea, monotonous piercing cry, deep stupor or coma.

Stages of bilirubin encephalopathy:
1. Asphyxia - lethargy syndrome (drowsiness, pathological yawning, hypotension, hyporeflexia)
2. Spastic - hypertonicity of the extensors, hands are clamped in a fist, rigidity of the limbs, occiput, head tilting, convulsions, cerebral cry, bradycardia, lethargy;
3. Imaginary well-being - spasticity, hypertonicity disappears;
4. Neurological complications (3-4 months) - cerebral palsy, paresis, developmental delay.

Risk factors that affect bilirubin levels and the severity of jaundice	**Risk factors for the development of acute lesions of the central nervous system (bilirubin encephalopathy)**
Prematurity Hemorrhages (cephalohematoma, skin hemorrhages) Inadequate nutrition, frequent vomiting A sharp decrease in body weight The presence of a generalized infection Incompatibility of the blood of the mother and the child by group and Rh factor Hereditary hemolytic anemia or hemolytic disease	Neonatal asphyxia Acidosis Prematurity Acute hemolysis Inadequate or no therapy for neonatal jaundice Hypoalbuminemia

Algorithm for differential diagnosis of neonatal jaundice (WHO, 2003)

№	**Signs ***			**Probable diagnosis**
	Anamnesis	**Clinical symptoms**	**Examination**	
1	Jaundice in the first 36 hours of a child's life	1. "Dangerous" jaundice	1. Hemoglobin is <13 g / dL (Hematocrit <40%)	**Hemolytic disease of the newborn**

	Pallor of the skin and mucous membranes Risk of ABO or Rh-incompatibility between mother and child or G6PDH deficiency in a previous child Familial cases of G6PDH deficiency, jaundice, anemia, Enlargement of the liver, removal of the spleen	2. Pallor of the skin and mucous membranes 3. Generalized edema 4. Male gender (only if G6FDH deficiency is confirmed)	2. Positive Coombs test 3. Group ABO or Rh-incompatibility between mother and child 4. Positive screening for G6FDG	Take measures to prevent anemia and treat hemolytic jaundice
2	Time of development of jaundice from the 2nd to the 5th day	"Dangerous" jaundice Low birth weight baby (baby weight at birth is <2500 grams or gestation < 37 weeks)	No other causes of jaundice have been identified	**Jaundice in a premature baby**
3	Time of development of jaundice from the 2nd to the 7th day	"Dangerous" jaundice	1. Sepsis 2. There is no confiration of other causes of jaundice	**Jaundice associated with sepsis** Sepsis treatment Phototherapy (if necessary)
4	The term for the development of jaundice is from 2 days and later	"Dangerous" jaundice	1. There is no confirmation of other causes of jaundice 2. Positive screening for G6FDG	**Jaundice associated with G6PDH deficiency** Treat as a hemolytic disease
5	Time of development of encephalopathy from the 3rd to the 7th day Late start or lack of treatment for "dangerous" jaundice.	1. "Dangerous" jaundice 2. Convulsions 3. Opisthotonus 4. The child is lethargic 5. Lethargy 6. Sluggish sucking	Positive Coombs test	**Bilirubin encephalopathy or kernicterus**

Basic principles for the care of newborns with jaundice

A. Research at the antenatal stage and in the early postpartum period.

1. At the antenatal stage, all pregnant women should determine the group and Rh-belonging of blood.
2. Immediately after the birth of a child from a mother with an Rh-negative affiliation, blood should be taken from the umbilical cord of the newborn to determine the blood group and its Rh affiliation. If the child has an Rh-positive blood affiliation, an additional direct Coombs' test should be performed and the level of bilirubin in the collected cord blood should be determined.
3. At the birth of a child from a woman with an unknown blood group and Rh-related blood, the child should take blood from the umbilical cord to determine its group and Rh-belonging, direct Coombs' test and the level of bilirubin (the normal indicator of the level of bilirubin in the umbilical cord blood is up to 50 micromol / l).
4. When a child is born from a woman with blood group 0 (I) and Rh-negative, blood should be taken from the umbilical cord of the newborn to determine the blood group. If any blood group is determined in a child, except for 0 (I), its Rh-affiliation and the level of bilirubin should be additionally determined.

B. Caring for newborns with neonatal jaundice

1. The principles of caring for a newborn with neonatal jaundice are fully consistent with the provisions set out in the Protocol of medical care for a healthy newborn child (Order of the Ministry of Health of Ukraine N 152 of 04.04.2005). In this case, special attention should be paid to total serum bilirubin erving the thermal protection of the child.
2. It is recommended that the newborn be examined at least every 8-12 hours while in the hospital for early detection of jaundice.
3. Ensuring the frequency of breastfeeding at least 8-12 times a day without a night break can reduce the risk of developing a calorie deficit and / or dehydration of the baby and, thus, increasing hyperbilirubinemia. At the same time, oral administration of water or glucose to newborns with jaundice does not prevent the development of hyperbilirubinemia and does not decrease bilirubin levels.
4. If it is impossible to ensure adequate breastfeeding, it is advisable to supplement the child with expressed breast milk.
5. If the amount of breast milk received cannot provide the required daily volume of fluid, intravenous fluid administration is possible.

Total Daily Fluid Requirements of Full-Term Infants (feeding and / or introduction) (WHO, 2003)							
Day of life	1	2	3	4	5	6	7 and over
Ml/kg body weight	60	80	100	120	140	150	160 or more

B. Use of drug therapy

1. To date, there is no scientific evidence base for the routine use of medications in the treatment of neonatal jaundice.

Classification of a newborn with jaundice and an IMCI strategy action plan

Severe jaundice ("Pink row")	• jaundice of any site that occurs before 24 hours of age, OR • jaundice of the palms and feet at any age	• it is necessary to carry out the prevention of hypoglycemia • quickly send to the hospital • advise the mother on how to keep the baby warm during transport
Jaundice ("yellow row")	• *jaundice that occurs between 24 hours of age, AND* • *palms and feet are NOT yellow;*	• advise the mother on how to care for the child, when to seek help • if the child is more than 14 days old, send to a hospital for examination; • re-examination after 1 day.
There is jaundice ("green row")	*No jaundice*	advise the mother on how to take care of the baby

Basic principles of the survey
and treatment of newborn with jaundice

Results	***Screening and treatment clinical examination***
Newborn with bilirubin umbilical cord blood levels above 50 mmol / l	1. It is necessary to re-determine the TSB no later than 4 hours after birth 2. Calculate the hourly increase in bilirubin levels. 3. In the future, it is recommended to conduct a laboratory examination depending on the clinical condition of the child.
Newborn with early or "dangerous" jaundice	1. Phototherapy should be started immediately. 2. Simultaneously with the beginning of phototherapy, take a blood sample to determine the blood pressure. 3. If at the birth of a child his blood group, Rh affiliation and direct Coombs' test were not determined, these studies should be carried out. 4. It is recommended to determine the level of hemoglobin, hematocrit, as well as counting the number of erythrocytes and reticulocytes. 5. In the presence of clinical data indicating other diseases, additional examinations are carried out in accordance with the relevant protocols
Newborn with uncomplicated "physiological" jaundice	
Jaundice appears from the end of the second day, does not go below the umbilical line (zones 1-2 on the Kramer scale)	Carry out TSB if possible Provide adequate breastfeeding Provide further supervision and care of the child
Child is active, reflexes are physiological, active sucking reflex, body temperature is normal	
Liver and spleen are not enlarged	
The urine is light, the amount of urination corresponds to the age of the child, the stools are colored	
Newborn with complicated "physiological" jaundice	

<table>
<tr><td>Jaundice appears from the end of the second day and spreads to areas below the umbilical line and to the extremities (zones 3-4 on the Kramer scale)
The child's condition may be impaired in the form of flabbiness, lethargy, and impaired reflexes (including the sucking reflex)
Liver and spleen can be enlarged
The urine is light, the amount of urination is age-appropriate, the stools are colored</td><td>With an undisturbed state of the child:
Determine total serum bilirubin
Decide whether to start phototherapy
Provide adequate breastfeeding
Provide further supervision and care of the child

If the child's condition is disturbed:
Start phototherapy immediately
Determine total serum bilirubin
Provide adequate breastfeeding
Provide further supervision and care of the child
Provide detection and treatment of comorbidities</td></tr>
<tr><td colspan="2">Newborn with prolonged (lingering) and tardive jaundice</td></tr>
<tr><td>Jaundice persists for more than 14 days in full-term and more than 21 days in preterm without a clear tendency to decrease

or

Jaundice appeared after 7 days of life
The child's condition can be satisfactory or impaired
Liver and spleen may be enlarged
Possible discoloration of urine and excreta</td><td>Determine the TSB and its factions
With an increase in the liver, determine ALT and AST
Conduct weight control of a newborn
Assess the adequacy of breastfeeding
Provide further screening for neonatal jaundice
Immediate hospitalization in the following cases:
Deterioration of the child's condition
TSB is more than 200 micromol / l
Fraction of direct bilirubin is more than 34 micromol / l (more than 20% of the level of TSB)
Enlarged liver or spleen
Dark urine and / or discolored stools</td></tr>
<tr><td colspan="2">Jaundice of «Breastfeeding»</td></tr>
<tr><td>In exclusively breastfed newborns, jaundice may have two peaks of bilirubin (between days 4-5 and 14-15).
A delayed decrease in the intensity of icteric staining of the skin can remain up to 12 weeks of life.</td><td>It is diagnosed by the method of exclusion in healthy full-term infants in the absence of disorders of the general condition.
Does not require drug therapy and termination of breastfeeding.</td></tr>
</table>

D. Phototherapy.

1. It is the most effective method for reducing bilirubin levels in newborns with neonatal jaundice. Timely and correctly administered phototherapy reduces the need for replacement blood transfusion by up to 4% and reduces the likelihood of complications of neonatal jaundice.

A chemical reaction in which light absorbs bilirubin in the skin:

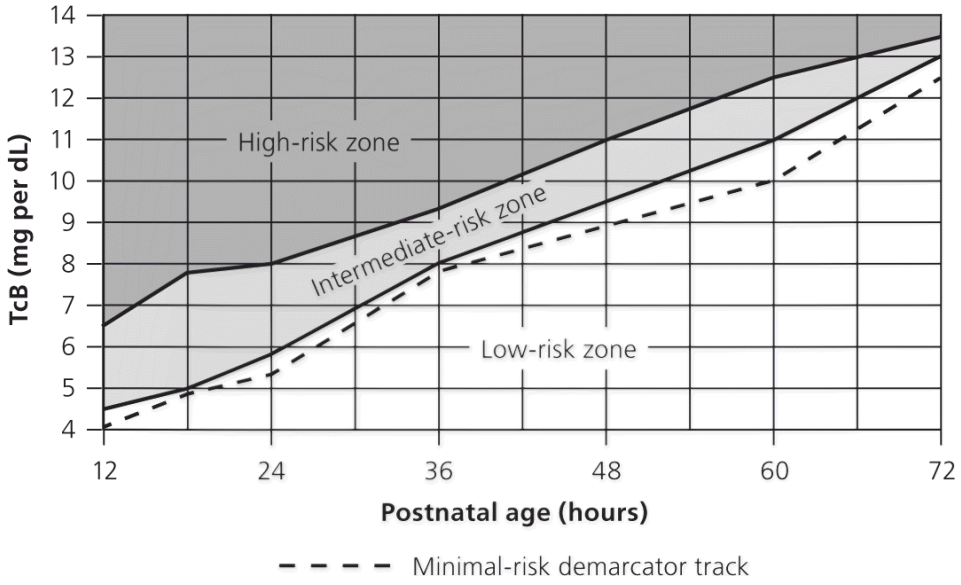
- converts the bilirubin molecule into foods that can bypass the conjugation system in the liver
- generates yellow stereoisomers of bilirubin (photoisomerization), which less penetrate the blood-brain barrier and can be excreted in bile or urine, or form colorless products with a lower molecular weight (photooxidation)
- the most effective is unidirectional (conventional) phototherapy with blue-green light from above in a narrow emission spectrum of 430-490 nm (70 nm)
- peak absorption of bilirubin is 460 nm
- the ratio of the linear dose depends on a high correlation between light emission and OBR.

The child's clinical response depends on:

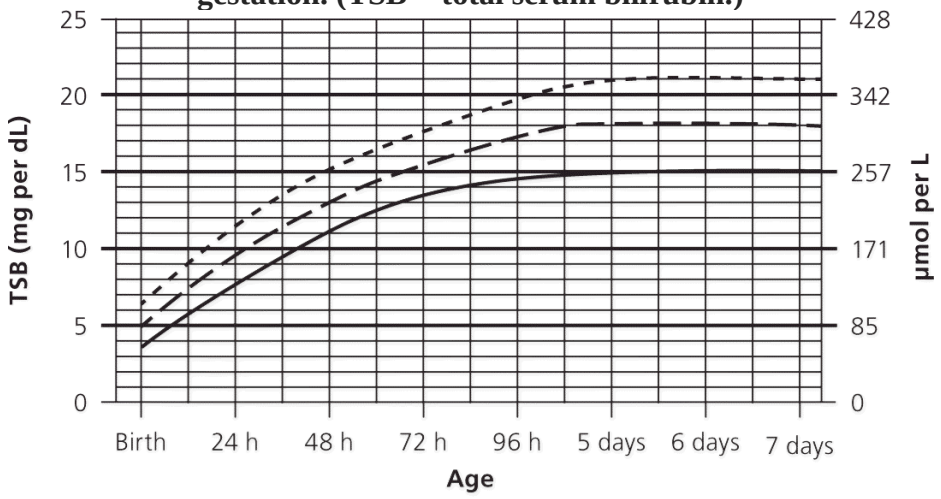
- The effectiveness of the phototherapy unit
- Balance between the rate of bilirubin production and its detoxification.

2. Indications for phototherapy and replaceable blood transfusion, depending on the level of total bilirubin in the blood serum:

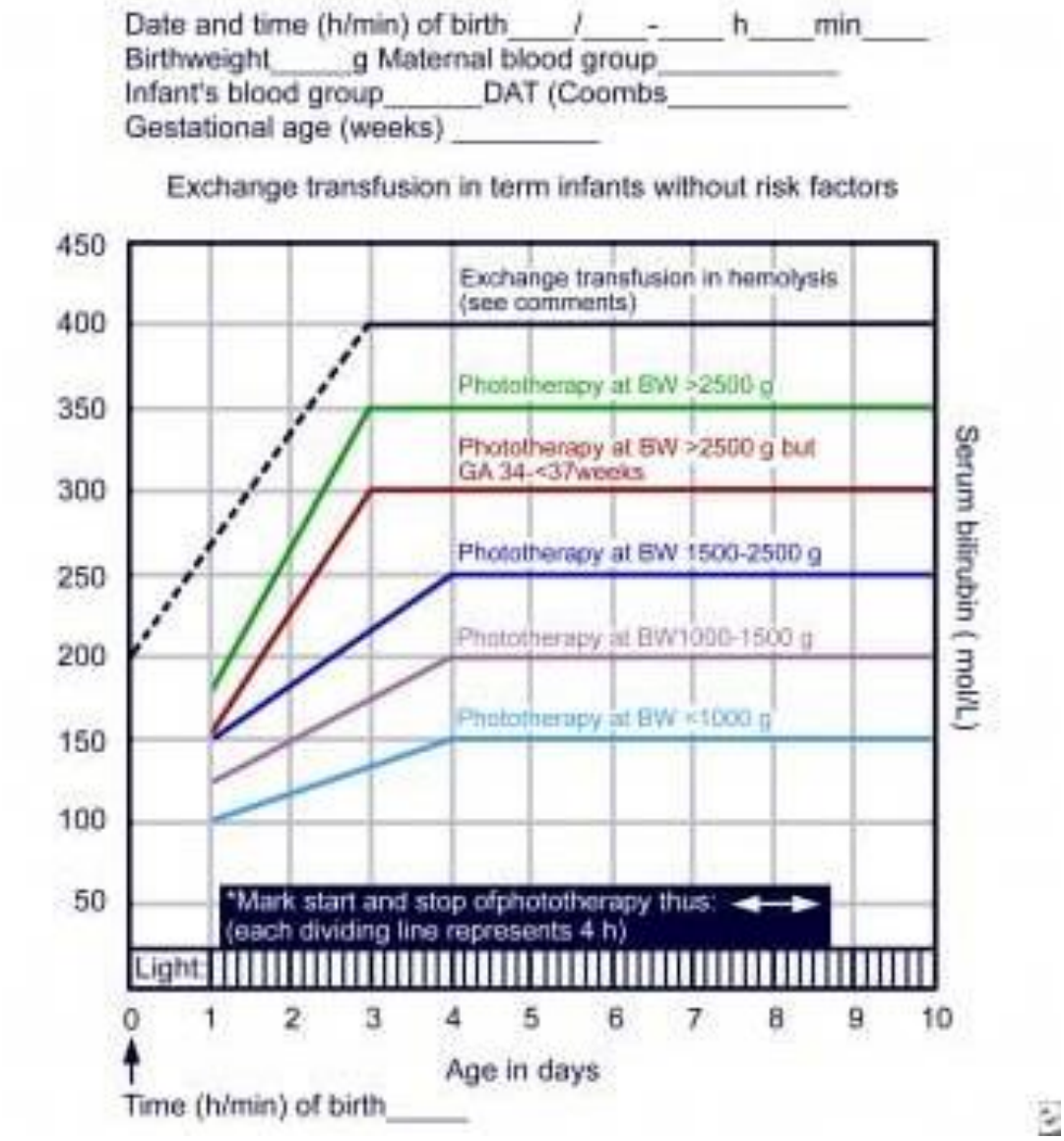
- **Transcutaneous bilirubin (TcB) nomogram for assessing the risk of subsequent significant hyperbilirubinemia in healthy term and near-term newborns.**



- **Guidelines for phototherapy in hospitalized infants delivered at 35 or more weeks' gestation. (TSB = total serum bilirubin.)**



- Use TSB. Do not subtract direct reacting or conjugated bilirubin.
- Risk factors include isoimmune hemolytic disease, glucose-6-phosphate dehydrogenase deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis, or albumin < 3.0 g per dL (30 g per L, if measured).
- For well infants delivered at 35 to 37⁶⁄₇ weeks' gestation, TSB levels for intervention can be adjusted around the medium-risk line. Intervention at lower TSB levels is an option for infants delivered closer to 35 weeks' gestation, and at higher TSB levels for those delivered closer to 37⁶⁄₇ weeks.
- Conventional phototherapy in the hospital or at home is an option for infants with TSB levels 2 to 3 mg per dL (35 to 50 mmol per L) less than those shown, but home phototherapy should not be used in any infant with risk factors.



3. Monitoring during phototherapy:
   - assessment of the clinical condition at least 3 times a day
   - skin coloration does not reproduce the existing level of hyperbilirubinemia during phototherapy and within 24 hours after its termination maintaining body temperature within 36.5-37.5°C, control every 3:00
   - control of the child's weight at least 1 time per day
   - continuation of breastfeeding on demand without a night break at least 8 times a day

4. Laboratory control:
   - Early and / or "dangerous" jaundice: re-determine TSB 4-6 hours after the start of phototherapy, later - depending on the result and the clinical condition of the child
   - Normally, during phototherapy, TSB decreases by 20-35 micromol / L or the growth rate decreases below the level that requires replacement transfusion within 4-6 hours from the start of phototherapy. Otherwise, consider the ineffectiveness of phototherapy and switch to intensive phototherapy or replacement blood transfusion.
   - "Physiological" jaundice or prolonged (prolonged) jaundice: the question of repeated laboratory examination should be decided individually in each case, depending on the clinical condition of the child.

5. Duration and discontinuation of phototherapy:

- in a full-term newborn, it is terminated if the TSB result is below the level indicated in the figure by the age of the child and the presence or absence of risk factors
- in a premature newborn, it stops when the TSB is below the level indicated in the figure by the age of the child for at least 12 hours

6. Methods of phototherapy:

- Classical phototherapy with lamp battery (most effective a)
- Fiber optic phototherapy using a mattress or diaper.
- "Intense" phototherapy using multiple light sources.
- "Spotted" phototherapy using halogen light sources.

7. Practical aspects of phototherapy:

- The phototherapy lamp is installed as close to the child as possible (according to the manufacturer's instructions).
- The baby must be completely undressed (diaper only).
- There is no need to cover the scrotum of boys with an opaque bandage.
- When carrying out phototherapy, the child's eyes are protected with glasses or an opaque bandage, it is possible to use moisturizing drops.
- When using one light source, it is advisable to change the position of the baby's body (preferably after each feeding) in order to irradiate the maximum surface of the newborn's body.
- To obtain the effect of phototherapy, it should be carried out continuously, except for the periods of feeding the baby.
- In case of severe hyperbilirubinemia, it is advisable to switch to intensive phototherapy using at least 2 light sources: a phototherapy lamp and / or photomatras. In the absence of several light sources, to increase the irradiation surface, you can cover the side walls of the crib or incubator with foil or a white cloth.
- If during phototherapy the child receives infusion therapy or is fed with expressed breast milk, it is advisable to increase the volume of injected fluid and / or milk by 10% of the daily requirement or by 0.5-1.0 ml / kg / hour.
- During phototherapy, it is necessary to continue treatment of the underlying or concomitant disease.
- During phototherapy it is necessary to pay attention to its possible complications for their timely elimination (diarrhea, burns, dehydration, skin rash).
- In the case of a satisfactory clinical condition of the child, phototherapy should be carried out in the conditions of a joint stay of the mother and the child.

The question of carrying out a replacement blood transfusion is decided in case of ineffectiveness of phototherapy, the development of a clinic of acute bilirubin encephalopathy, or in the case of an increase in total bilirubin to critical levels.

E. Substituted blood transfusion. Indications:

1. The appearance of the first symptoms of bilirubin encephalopathy, regardless of the level of TSB.

2. Ineffectiveness of phototherapy if the bilirubin level exceeds the values indicated in the nomograms. Intensive phototherapy is recommended before deciding on PPC.

3. ZPC is performed mainly in newborns with severe hemolytic disease.

E. Forecast and statement

1. If the child is discharged on the 3rd day of life, it is necessary to examine the child at home until the child reaches 120 hours of life (5 days).
2. In case of uncomplicated course of "physiological" jaundice, prevalence of icteric skin coloration not below the umbilical line, good clinical condition of the child and well-functioning breastfeeding, the child can be discharged home under the supervision of a local pediatrician or family doctor.
3. With successful phototherapy, the issue of the child's discharge from the medical institution can be resolved no earlier than 24 hours after the completion of phototherapy and in the case of a satisfactory clinical condition of the child, no increase in icteric skin coloration after the termination of phototherapy.
4. The result of the last sidetracking measurement should be noted on the nomogram.
5. If phototherapy was not carried out, but at the time of possible discharge, the icteric color of the skin spreads below the umbilical line, it is necessary to determine the ZBS and note the value on the nomogram.
6. If the TSB result is in the high-risk zone, or in the high-intermediate-risk zone if the child has concomitant risk factors, there is a high probability that the bilirubin level will exceed the 95th percentile in the coming days, which may require treatment → discharge should be postponed at least for 24 hours or transfer the newborn to the neonatology department.
7. If the TSB result is in the low-risk zone, the likelihood of further increase in hyperbilirubinemia is minimal.
8. If the result of the TSB is in the zone of intermediate risk, the presence of concomitant risk factors should be taken into account and the issue of discharge should be decided individually.

G. After discharge from the maternity hospital of a child with jaundice or when it appears after discharge:

1. Assess the localization of jaundice, the general clinical condition of the child, the adequacy of feeding

2. In the presence of icteric staining of the child's skin only up to the level of the umbilical line and with a good clinical condition of the child, the child should be total serum bilirubin erved at home without compulsory laboratory examination.

3. If jaundice spreads to the extremities (especially the palms and feet of zone 4-5 on the Kramer scale) and / or long-term storage of icteric staining of these zones, the child should be referred to a medical facility.

H. Registration of medical records

1. "Physiological" uncomplicated jaundice of a newborn is not a pathological condition and does not require registration.
2. With the development of a pathological condition, the following ICD-10 codes should be used:
- P55 - Hemolytic disease of the fetus and newborn
- P57 - Kernicterus
- P58 - Neonatal jaundice due to other forms of excessive hemolysis
- P59 - Neonatal jaundice of other unspecified causes
- P53.3 - Congenital viral hepatitis
- Q44 - congenital malformations of the gallbladder, bile ducts and liver.

6. Materials for methodological support of the lesson

6.1. Tasks for self-examination of the initial level of knowledge and skills (with the provision of standards of answers at the end of the block of tasks - tasks of the 2nd level; tests of various types also with standards of answers)

1. In a child with an increase in the level of direct bilirubin, atresia of the biliary tract cannot be excluded. In case of atresia of the biliary tract in a newborn, jaundice ...
1. Actively grows for 2-4 weeks +
2. Maybe at birth
3. Grows as much as possible at 3-5 days of life
4. It can not be pronounced
5. All of the above is incorrect

2. A premature baby born with a weight of 1900 at 34 weeks of gestation was diagnosed with conjugational jaundice. For the treatment of jaundice, the following are widely used:
1. Phenobarbital
2. Phototherapy +
3. Infusion therapy
4. Replacement blood transfusion surgery
5. All answers are correct

3. A newborn baby is 3 days old. Diagnosed with hemolytic disease, Rh-conflict, icteric form. At what concentration of indirect bilirubin is it possible for bilirubin encephalopathy to develop on the 3rd day of life? (Mcmol / L)
1.340 +
2.172
3.256
4.396
5.300

4. A newborn child has been diagnosed with hemolytic disease of the newborn, a conflict in the ABO blood group system. At what levels of bilirubin in the umbilical cord blood and hourly growth, will you start the operation of a replaceable blood transfusion?
1. 50 mcmol / L and 3.5-4 mcmol / L / h
2.80 mcmol / L and 10.0 mcmol / L / h +
3. All of the above is incorrect
4. All of the above is true

5. A newborn child undergoes conservative treatment of hemolytic disease, phototherapy sessions. Determine the increase in daily fluid intake during phototherapy?
1.10-20% +
2.30-40%
3.50%
4.60%
5.70%

6.2. The information necessary for the formation of knowledge and skills can be found:

- *basic:*

1. New clinical protocol "Assistance to newborns with jaundice". Queensland Clinical Guidelines. on the basis of the requirements of the order of the Ministry of Health of Ukraine No. 1422 of December 29, 2016 "On amendments to the order of the Ministry of Health of Ukraine of September 28, 2012 No. 751". https://drive.google.com/file/d/1hm41Zfvot3Ea2Rtz2VEAfztT40o-ZtPa/view

2. Pediatrics Textbook in two volumes, ed. M.L. Aryaev, N.V. Kotova. - Vol. 1. Neonatology. Hematology. Endocrinology. - Odessa: ONMedU. - 2014. - 155 p.

3. Zubarenko A.V., Aryaev N.L., Elder E.A. et al. Pediatric skills in the practice of a family doctor and pediatrician: textbook. - Odessa: Printing House Printing South, 2014. - 232 p.

-additional:

1. Differential diagnosis of the most common diseases of childhood. Textbook / ed. V.M. Dudnyk, 1st edition. Vinnytsia: Nilan Ltd., 2017. 560 p
2. Shandrin A.G, Chernega N.F Ways of optimization of therapy of prolonged conjugative jaundice in infants // Child health. -2015. - №6 (66). - P. 19-22
3. Malich T.S. Neonatal jaundice // perinatology and pediatrics. - 2013. - №. 4. - P. 114-120.
4. Klyuchareva A.A. Congenital hemocontact infections: diagnosis, treatment, prevention: teaching method. textbook: in 3 parts / AA Klyuchareva. Minsk: BelMAPO, 2016. Part 1: Perinatal prevention of hepatitis P. 118 p.
5. Karen J. Markdante, Robert M. Kligman. Fundamentals of Pediatrics according to Nelson: translation of the 8th English. edition: in 2 volumes. Volume 1. Kyiv: VSV "Medicine", 2019. XIV, 378 p.
6. Karen J. Markdante, Robert M. Kligman. Fundamentals of Pediatrics according to Nelson: translation of the 8th English. edition: in 2 volumes. Volume 2. Kyiv: VSV "Medicine", 2019. XIV, 426 p.

6.3. Indicative map for independent work with literature on the topic of the lesson.

№ п/п	The main tasks	Instruction	Answer
1	2	3	4
1.	Get acquainted with the literature and the objectives of the lesson	Give a definition	Formulate the concept of "physiological" and "dangerous" jaundice. Discuss caring for a newborn with neonatal jaundice; risk factors affecting the severity of jaundice. Consider the features of the exchange of bilirubin during the neonatal period.
2.	Epidemiology	List the risk factors for the development of diseases. Know their prevalence among the child population.	

3.	Etiology	Know what factors matter	The basics of the development of neonatal jaundice.
4.	Pathogenesis	Know modern ideas about pathogenesis	Specific and non-specific mechanisms are the basis of pathogenesis.
5.	Classification	Know the classification	Be able to diagnose
6.	Clinic	Describe the clinical presentation of neonatal jaundice.	To be able to conduct a clinical examination and assessment of jaundice, to work out the method of conducting phototherapy in a newborn, the method of performing a replacement blood transfusion (RPT)
7.	Diagnostics	Know on the basis of what this disease is diagnosed in newborns.	Be able to evaluate the results of laboratory and instrumental research method.
8.	Dif. diagnostics	List diseases with similar clinical and laboratory manifestations	Pay attention to the complexity of the diff. diagnostics of various forms of neonatal jaundice.

7. Materials for self-control on the quality of training

Questions:

1. Features of the exchange of bilirubin in the neonatal period.
2. Determination of physiological reflexes of the neonatal period.
3. Classification of jaundice in newborns.
4. Algorithm for differential diagnosis of neonatal jaundice.
5. The concept of "physiological" and "dangerous" jaundice.
6. Methods of clinical examination and assessment of jaundice.
7. Risk factors affecting the severity of jaundice.
8. Caring for newborns with neonatal jaundice.
9. Laboratory screening.
10. Technique for carrying out phototherapy in a newborn.
11. Methodology for the operation of replacement blood transfusion.
12. Forecast and statement.

8. Materials for classroom and self-study.
The list of educational practical tasks that must be completed during practical training.

1. Metabolism of bilirubin in newborns.
2. Factors increasing the neurotoxicity of bilirubin, criteria for "dangerous neonatal jaundice".
3. Methods of clinical examination and assessment of jaundice (Kramer's scale).
4. Algorithm for differential diagnosis of neonatal jaundice.
5. Basic principles of management of newborns with jaundice.

9. Instructional materials for mastering professional skills. Methodology for performing work, stages of implementation

1. Evaluate the data obtained from the anamnesis of life and illness, highlight the risk factors that play a role in the occurrence of diseases.
2. Conduct a clinical examination of the patient.
3. Draw up a plan for additional examination.
4. Evaluate the results of laboratory and instrumental examination of the patient.
5. Formulate a clinical diagnosis according to the classification

10. Materials for self-control of mastering knowledge, abilities, skills provided for by this work.

10.1. Tests of different levels (included)

1. In a child with an increase in the level of direct bilirubin, atresia of the biliary tract cannot be excluded. In case of atresia of the biliary tract in a newborn, jaundice ...
1. Actively grows for 2-4 weeks +
2. Maybe at birth
3. Grows as much as possible at 3-5 days of life
4. It may not be pronounced
5. All of the above is incorrect

2. A premature baby born with a weight of 1900 at 34 weeks of gestation was diagnosed with conjugational jaundice. For the treatment of jaundice, the following are widely used:
1. Phenobarbital
2. Phototherapy +
3. Infusion therapy
4. Replacement blood transfusion surgery
5. All answers are correct

3. A newborn baby is 3 days old. Diagnosed with hemolytic disease, Rh-conflict, icteric form. At what concentration of indirect bilirubin is it possible for bilirubin encephalopathy to develop on the 3rd day of life? (Mcmol / L)
1.340 +
2.172
3.256
4.396
5.300

4. A newborn child has been diagnosed with hemolytic disease of the newborn, a conflict in the ABO blood group system. At what levels of bilirubin in the umbilical cord blood and hourly growth, will you start the operation of a replaceable blood transfusion?

1. 50 mcmol / L and 3.5-4 mcmol / L / h
2.80 mcmol / L and 10.0 mcmol / L / h +
3. All of the above is incorrect
4. All of the above is true

5. A newborn child undergoes conservative treatment of hemolytic disease, phototherapy sessions. Determine the increase in daily fluid intake during phototherapy?
1.10-20% +
2.30-40%
3.50%
4.60%
5.70%

6. Phototherapy is prescribed for a newborn child after a replacement blood transfusion operation due to hemolytic disease of the newborn. Or is this assignment shown?
1. Sometimes it takes place
2. Not shown
3. Necessarily shown +
4. Never shown

7. As a result of the transferred hemolytic disease of newborns, the child developed nuclear jaundice. Are the late signs of kernicterus included?

1. Apnea

2. Sudorgi

3. Syndrome of the "setting sun"

4. Opistotonus, bringing the arms to the body, rotation

5. All answers are correct +

10.2. Tasks:
1. A child born to a mother whose blood group is O (I), Rh (-), from the fifth pregnancy, complicated by late gestosis. Previous pregnancies: 2 medical abortions, 2 miscarriages. The child's body weight at birth is 3500 g, length is 47 cm, Apgar score is 3 - 5 points. Objective examination data 2:00 after birth: the general condition is very serious, the child is adynamic, the skin and mucous membranes are pale, slightly icteric, general tissue edema (anasarca). The child does not cry, reacts to examination with a painful grimace, muscle atony, physiological reflexes are not evoked. The respiratory rate is 68 per 1 min, auscultation over the lungs against the background of weakened vesicular respiration, moist rales. The heart rate is 180 in 1 min, percussion, a significant expansion of the boundaries of cardiac dullness, deaf heart sounds. The abdomen is significantly increased in size, ascites, the liver is + 6 cm, the spleen is + 4 cm. Results of blood tests from the umbilical cord of the child: blood group O (I), Rh (+); hemoglobin is 50 g / l; erythrocytes are 1.5 T / L; reticulocytes are 15%; normoblasts are 70 per 100 leukocytes, total bilirubin is 78 μmol / l, indirect bilirubin is 78 mcmol / l, direct bilirubin is 10 mcmol / l, total protein is 30 g / l.

What is the most likely diagnosis?
1. HDN for Rh-factor, edematous form
2. HDN for Rh-factor, icteric form
3. Congenital leukemia
4. Sepsis of the newborn

2. In a full-term baby born from 2 pregnancies, 1 birth (the first pregnancy ended in miscarriage) by a mother whose blood group is A (II), Rh (-), yellowness of the skin grew within 10 hours after birth, jaundice first appeared on the face, then on the trunk and limbs. As jaundice developed, the child's condition worsened, hypotension and hyporeflexia leaked out. Respiration rate is 48 per minute, vesicular breathing. Heart rate is 148 in 1 min. The abdomen is soft, the liver is palpable 2.5 cm below the costal arch, the spleen is 1.5 cm below the costal arch. The meconium has passed, the urine is colorless. The results of the child's blood test: A (II), Rh (+), hemoglobin is 160 g / l, erythrocytes are 3.5 T / l, reticulocytes are 8%, total cord blood bilirubin is 58 mcmol / l. 10 hours after birth: the level of total bilirubin is 130 mcmol / l due to the indirect fraction; ALT is 0.4, AST is 0.4.

What laboratory test will confirm the diagnosis?
1. Research for the detection of TORCH - infections
2. Erythrocytometry
3. Determination of osmotic resistance of erythrocytes
4. Direct Coombs test

3. The child was born by a mother with blood group B (III) Rh (-) from the third pregnancy, second birth. The first pregnancy ended with the birth of a healthy child, the second pregnancy ended with a medical abortion. When examining the mother during pregnancy, the anti-Rh antibody titer in the blood is 1: 16; 1: 32. Immediately after birth, the child's general condition is satisfactory, it is active, the skin is pink, the muscle tone is satisfactory, the reflexes of the neonatal period are lively, symmetrical, vesicular breathing, heart sounds are clear, the abdomen is soft, the liver is + 1.5 cm, the spleen is at the edge costal arch. In laboratory tests of umbilical cord blood: child's blood group B (III) Rh (+), hemoglobin is 170 g / l, erythrocytes are 4.5 T / l, hematocrit is 0.54, reticulocytes are 8%, total bilirubin is 60 mcmol / l, direct Coombs' test is positive.

What research method will help determine treatment tactics?
1. Biochemical study of ALT and AST
2.proteinogram
3. Hourly increase in bilirubin
4. Complete blood count

4. The child was born by a mother with blood type A (II) Rh (-), from the first physiological pregnancy. Child's body weight is 3500g, length is 51 cm, Apgar score is 8 - 9 points. On the 2nd day of life, the general condition of the newborn is satisfactory, the child is active, breastfeeds if necessary, the skin is pink, the muscle tone is satisfactory, the reflexes of the neonatal period are vivid, symmetrical. Respiration rate is 44 per 1 min, vesicular breathing, heart rate is 140 per min., Heart sounds are clean, abdomen is soft, liver is + 1.5 cm, spleen at the edge of the costal arch, regular stools, free urination. In laboratory tests of umbilical cord blood: child's blood group B (III) Rh (+), hemoglobin is 190 g / l, erythrocytes are 5.5 T / l, hematocrit is 0.58, reticulocytes are 3%, total bilirubin is 35 mcmol / l, direct Coombs' test is negative.

What should be given to the mother?
1. Glucocorticoids
2. Anti Rh (D) - immunoglobulin
3. Antihistamines
4. vitamin therapy

5. A full-term baby was born from the first pregnancy by a mother whose blood group is O (I) Rh (+), with a baby's body weight of 4000 g, length is 56 cm, an Apgar score is of 8 - 9 points, in

a satisfactory condition with no signs of any -or diseases. Results of blood tests from the umbilical cord: child's blood group A (II) Rh (+), hemoglobin is 190 g / l, erythrocytes are 5.8 T / l, hematocrit is 0.58, total bilirubin is 48 mcmol / l. At the end of the 2nd day of the child's life, the skin became icterus, first on the face, then on the trunk. On the 3rd day, the limbs, feet and hands of the newborn baby also became icteric.

What is the level of bilirubin on the Kramer scale roughly corresponds to the severity of jaundice in a newborn baby?
1.100 mcmol / L
2.150 mcmol / l
3.200 mcmol / l
4. More than 250 mcmol / l

6. The child was born from the fifth pregnancy, the second childbirth by a mother whose blood type is O (I), Rh (-). The first pregnancy was ended with the birth of a healthy child, subsequent pregnancies were ended with a medical abortion. The current pregnancy proceeded with the threat of termination at 12 weeks and gestosis in the third trimester. The child was born at 36 weeks of gestation with a body weight of 2500 g, length is 47 cm, Apgar score is 5 - 6 points. The child's condition after birth is severe: weakness, areflexia, pale icteric skin, no edema; respiratory rate is 60 per minute, breathing is weakened; muffled heart sounds, heart rate is 160 in 1 min. The abdomen is enlarged, with palpation of the abdomen, the liver is 3.5 cm, the spleen is + 3 cm. Results of blood tests from the umbilical cord: child's blood group O (I) Rh (+), hemoglobin is 90 g / l, erythrocytes are 3.1 T / l, reticulocytes are 16%, total bilirubin is 98 mcmol / l, direct Coombs' test is positive.

What therapy should be given to a child?
1. Introduction of erythrocyte mass
2. An exchange transfusion
3. Infusion therapy
4. Plasmapheresis

7. The child was born at 34 weeks of gestation with a body weight of 1400 g, a body length of 41 cm, an Apgar score of 5-7 points, with duodenal atresia. On the 2nd day of life, the newborn underwent surgical correction of this malformation. A child is on full parenteral feeding, receives antibiotic therapy for 7 days.

What is advisable to prescribe a sick child to prevent hemorrhagic syndrome?
1. Fresh frozen plasma
2. Solid
3. Vitamin K3
4. Thromboconcentrate

Standards of responses to clinical situational tasks and explanations to them

Task 1. Answer 1. Hemolytic disease of the newborn according to the Rh-factor, edematous form. This is evidenced by a burdened total serum bilirubin tetric history, a serious condition of the child from birth, the presence of anasarca, heart failure, severe changes in laboratory parameters (anemia, normoblastosis), hypoproteinemia.

Task 2. Answer 4. Direct Coombs test. The direct antiglobulin test is used to detect antibodies or complement components fixed to the surface of red blood cells. A positive direct Coombs' test shows that in vivo erythrocytes are coated with immunoglobulins or complement, that is, it confirms the presence of hemolytic disease of the newborn.

Task 3. Answer 3. The hourly increase in bilirubin is an objective indicator of the dynamics of bilirubinemia; this indicator allows you to determine the progression of hemolysis. An hourly increase in bilirubin ≥ 7 mcmol / L in hemolytic disease according to the Rh-factor and 10 mcmol / L in hemolytic disease of newborns according to the AB0 system is an indication for the operation of a replaceable blood transfusion.

Task 4. Answer 2. Anti Rh (D) - imunoglobulin. Specific prophylaxis of hemolytic disease of newborns according to the Rh factor is carried out for all Rh-negative women sensitized to the Rh-antigen, who gave birth to Rh-positive children in the first 48-72 hours after childbirth.

Task 5. Answer 4. More than 250 mcmol / l. The icterus of the skin of the face, trunk of the extremities, in particular of the hands and feet in a newborn child corresponds to zone 5 on the Kramer scale and indicates an approximate level of total bilirubin in the blood > 250 mcmol / l.

Task 6. Answer 2. Substitute blood transfusion. The child has congenital hemolytic disease of newborns - icteric form, severe course, there are indications (hemoglobin is < 100 g / l, total bilirubin level in umbilical cord blood is > 80 mcmol / l for immediate replacement of blood transfusion.

Task 7. Answer 3. Vitamin K3. The child has risk factors for secondary vitamin K deficiency with the development of hemorrhagic disease of the newborn (prematurity, complete parenteral nutrition, antibiotic therapy), therefore, it is advisable to prescribe vitamin K3. Fresh frozen plasma is prescribed for the treatment of hemorrhagic disease of the newborn, but is not used to prevent the disease.