Neonatal Jaundice
Neonatal jaundice is manifested by yellow coloring of the skin, of sclera and mucousa caused by accumulation of bilirubin in the tissues accompanied by the increase in total bilirubin blood of the newborn to 50-70 mcmol / l.

Each case must be investigated to exclude an etiology with significant morbidity.
Physiological jaundice

- Jaundice begins after 36 hours of birth, most often after 48 hours. Jaundice is with indirect bilirubin. Bilirubin after the second day of life don’t exceed 262 mcmol / l for in full- term newborn and 210 mcmol / l for premature infants. The clinical status of the newborn is good. The jaundice regression in the newborn takes 7-10 days to in term newborn and 21-28 days to premature infant.

- This type of jaundice do not require treatment.
Pathological jaundice

- Early onset than 36 hours after birth.
- It is manifested by: Rh- factor and/or ABO incompatibility, hemolytic anemia with Hb lower than 170 g / l at birth, reticulocytes > 8-10, total bilirubin> 65-85 mcmol / l per hour.
- Is a persistent clinical jaundice in the newborn on pale skin background and with hepato-splenomegaly.
- Associate Clinical signs: lethargy, eating disorders, neurological disorders.

This type of jaundice requires treatment.
Jaundice in premature newborns

Frequently it occurs in about 90% cases. Jaundice of prematurity should be treated at a lower bilirubin levels than full-term infants to avoid complications.
What can be the consequences of a pathological jaundice

- Rarely large amounts of bilirubin accumulates in the blood and cause brain damage, associated with hearing loss, mental retardation and behavioral disorders.
Clinical signs of nuclear jaundice (kernicterus) independent on the stage

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(early step)</td>
<td>(late step)</td>
<td>(chronic step)</td>
</tr>
<tr>
<td>Weakness</td>
<td>Extensor muscles</td>
<td>Athetosis-partial or complete</td>
</tr>
<tr>
<td>Lethargy</td>
<td>Hypertonicity</td>
<td>Ataxia</td>
</tr>
<tr>
<td>Strident cry</td>
<td>Opisthotonus</td>
<td>Deafness</td>
</tr>
<tr>
<td>Weak sucking reflex</td>
<td>Rigidity</td>
<td>Medium or severe mental retardation</td>
</tr>
<tr>
<td>Hypotonia</td>
<td>Bulging fontanel</td>
<td></td>
</tr>
<tr>
<td>Poor Moro reflex</td>
<td>Fever</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seizures</td>
<td></td>
</tr>
</tbody>
</table>

**ATHETOSIS** is a condition in which abnormal muscle contractions cause involuntary writhing movements. It affects some people with cerebral palsy, impairing speech and hearing loss.
## Jaundice ethiology

<table>
<thead>
<tr>
<th>&lt;24 ore</th>
<th>≥24 ore - 14 zile</th>
<th>≥ 14 zile pentru nn la termen ≥ 21 zile pentru nn prematur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rh factor incompatibility</td>
<td>sepsis</td>
<td>conjugated hyperbilirubinemia</td>
</tr>
<tr>
<td>ABO incompatibility</td>
<td>Hemolysis</td>
<td>- Infection (Hepatitis B, TORCH, sepsis)</td>
</tr>
<tr>
<td>bacterial sepsis</td>
<td>cephalhematoma</td>
<td>- Congenital malformations (biliary atresia, bile duct cysts, duct stenosis)</td>
</tr>
<tr>
<td>specific infection</td>
<td>intracranial hemorrhage</td>
<td>- Metabolic Diseases (galactosemia, fructose intolerance, alpha-1 antitrypsin deficiency, tyrosinemia, hypothyroidism)</td>
</tr>
<tr>
<td>spheroctosis</td>
<td>physiological jaundice</td>
<td>Hemolysis</td>
</tr>
<tr>
<td>Deficiency of glucose - phosphate dehydrogenase</td>
<td>breast milk jaundice</td>
<td>breast milk jaundice</td>
</tr>
<tr>
<td>Metabolic Diseases (galactosemia, fructose intolerance, alpha-1 antitrypsin deficiency, tyrosinemia, hypothyroidism)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Hemolysis
- Breast milk jaundice
Clinical evaluation

- Jaundice skin and mucous membranes
- Pallor
- Gray-white (acholic stool)
- Hepatosplenomegaly
Rules for examination of a child with jaundice

- Assessment of the jaundice is always daylight
- The absence of jaundice doesn’t mean the absence of jaundice
- Visual assessment of bilirubin depending on the degree of jaundice can lead to errors, especially in children with more intensely pigmented skin tone
- Skin discoloration will be assessed in accordance with Kramer diagram to assess cerebrospinal caudal progression and intensity of neonatal jaundice.
### Kramer diagram

<table>
<thead>
<tr>
<th>Zone</th>
<th>Affected region</th>
<th>Indirect serum bilirubin level, media</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Head and neck</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Upper part of the trunk</td>
<td>150</td>
</tr>
<tr>
<td>3</td>
<td>Lower abdomen</td>
<td>200</td>
</tr>
<tr>
<td>4</td>
<td>Arms and legs</td>
<td>250</td>
</tr>
<tr>
<td>5</td>
<td>Palms and plants</td>
<td>&gt;250</td>
</tr>
</tbody>
</table>
Clinical signs suggesting probability of the hemolytic disease

- Familiar anamnesis
- Jaundice <24 hours
- Bilirubin > 85.5 mcmol / hour at birth with growth of 8.5 mcmol / hour
- Pallor
- Hepatosplenomegaly
- Erythrocyte hemolysis increases rapidly after 24-48 hours (G6PD)
- Failure phototherapy
Laboratory examinations

- Bilirubin (total and indirect)
- Blood group and Rh factor of the child
- Maternal blood group and Rh antibodies screening
- Peripheral smear for red cell morphology
- Hematocrit level (Polycythaemia or anemia)
- The level of serum albumin and bilirubin / albumin ratio in hyperbilirubinemia

Reduce to a minimum loss of blood during collection.
Prevent Dolor syndrome during collection
For the analyzes collecting respect the protective and preventive measures for the nosocomial infection
The frequency of monitoring serum bilirubin in neonates

<table>
<thead>
<tr>
<th>Hours of life</th>
<th>1 day</th>
<th>2 day</th>
<th>3 day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>frequency</td>
<td>tactics</td>
<td>frequency</td>
</tr>
<tr>
<td>Visible jaundice</td>
<td>BT</td>
<td>BC</td>
<td>BC</td>
</tr>
<tr>
<td>85-100</td>
<td>3-5 hours</td>
<td>FT</td>
<td>8-12 hours</td>
</tr>
<tr>
<td>120-190</td>
<td>3-4 hours</td>
<td>Consult FT</td>
<td>4-6 hours</td>
</tr>
<tr>
<td>200-250</td>
<td>2-3 hours</td>
<td>Consult FT</td>
<td>2-4 hours</td>
</tr>
<tr>
<td>&gt;250</td>
<td>EXT</td>
<td>2-3 hours</td>
<td>Consult FT</td>
</tr>
</tbody>
</table>
The frequency of monitoring serum bilirubin in neonates

- In children with discovered jaundice in the first 2-3 days of life, it is helpful to note the rate of increase in serum bilirubin.

- An increase > 8.5 mcmol/l per hour indicates a rapid hemolysis.
<table>
<thead>
<tr>
<th>Age (hours)</th>
<th>It’s possible FT</th>
<th>FT</th>
<th>Exchange blood transfusion if intensive FT isn’t respond</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;24</td>
<td>≥65</td>
<td>≥85</td>
<td>≥100</td>
</tr>
<tr>
<td>25-48</td>
<td>12(170)</td>
<td>15 (260)</td>
<td>20 (340)</td>
</tr>
<tr>
<td>48-72</td>
<td>15(260)</td>
<td>18 (310)</td>
<td>25 (430)</td>
</tr>
<tr>
<td>72</td>
<td>17(290)</td>
<td>20 (340)</td>
<td>25 (430)</td>
</tr>
</tbody>
</table>
Indications for phototherapy and exchange blood transfusion

- ExBT
- FT or ExBT initiation
- Repeat bilirubin or FT initiation
- Repeat bilirubin
- Observation / monitoring bilirubin
- Phototherapy
- Breastfeeding
- Physiological jaundice
Complications of phototherapy

- INCREASED OF INSENSIBLE WATHER
- DEHYDRATION
- DIARRHEA
- SKIN RASH
- NASAL OBSTRUCTION
- POTENTIAL RETINAL DAMAGE
The 10 principles of jaundice’s prevention and management

1. Promote and support successful breastfeeding
2. Develop clinical protocols for jaundice
3. Measure the total serum bilirubin or conjugated bilirubin to a sick child with jaundice in the first 24 hours
4. Recognize Visual jaundice, especially in a child intensely pigmented
5. Interpret level of bilirubin in hours not days
6. Do not treat the near-term newborns (35-37 sg) as a term newborn - these children represent a higher risk of developing hyperbilirubinemia
7. Evaluate systemic all infants with severe risk of hyperbilirubinemia
8. Inform parents about jaundice newborn
9. Include severe jaundice in newborn Program Follow - up
10. At indications treat newborn with phototherapy and / or ExBT
The neonatal jaundice’s treatment

FT

ExBT
The neonatal jaundice’s treatment

- **Intensive phototheraphy**

- Intensive phototherapy decreases bilirubin level to 15-34 mcmol / l in 4-6 hours

- In case of hydrops, sepsis, asphyxia, severe anemia, the indicated limits should be reduced by 50

- Apply immediately intensive phototherapy in rhesus sensitization to keep bilirubin under 85 mcmol / l in the ABO isoimmunization - to keep bilirubin
  - >120 mcmol / l in the first 12 hours;
  - 170 mcmol / l at 18 hours;
  - 260 mcmol / l at any time post-partum
Phototherapy technology

- Place the undressed baby under the lamp
- Monitorize your child's temperature every 3 hours
- Monitorize weight daily
- Protect your child's eyes and genital organs
- The distance between infant and phototherapy lamp must be 50 cm (where’s no other distance specified in the Technical Passport)
- Duration of phototherapy depends on the bilirubin level (continuous or intermittent light flow)
- Increase your fluid intake by 10-20% compared to the physiological needs
- After 12-14 hours after stopping phototherapy check serum bilirubin level
Phototherapy complications

- Frequent stools
- Dehydration
- Overheating
- Skin rashes
- Retinal damage
- Irritability or lethargy
- Tanning baby syndrome
Exchange blood transfusion

- The formula for calculating the volume required for ExBT (RV)
  \[ RV = 2 \times CBV \times M \]  
  RV consists of 1 part of red blood cells and 2 parts of plasma

- In case of Rh factor incompatibility - order red blood cells and plasma of the newborn blood type, Rh negative

- In case of incompatibility in the ABO system - order red blood cells group 0 (I) and plasma group AB (IV), Rh negative

- In case of Rh factor and ABO system incompatibility - order red blood cells group 0 (I) and plasma group AB (IV), Rh negative