Hyperbilirubinemia
Web Meeting
2018

Dr. Ann Anderson Berry
Introduction
Objective

• Describe evidence-based practices (EBP) to prevent hyperbilirubinemia and kernicterus
• All newborns will have a prn bilirubin order (TSB or TCB) to be initiated at the nurse’s discretion (AAP)

-Visual assessment not accurate (Keren)


EBP

- Universal predischarge bilirubin screening - TSB or TcB
- Use of clinical risk factors and predischarge bili to predict risk of hyperbilirubinemia


### Risk Factors

#### TABLE 2. Risk Factors for Development of Severe Hyperbilirubinemia in Infants of 35 or More Weeks’ Gestation (in Approximate Order of Importance)

**Major risk factors**
- Predischarge TSB or TcB level in the high-risk zone (Fig 2)
- Jaundice observed in the first 24 h
- Blood group incompatibility with positive direct antiglobulin test, other known hemolytic disease (eg, G6PD deficiency), elevated ETCo₂
- Gestational age 35–36 wk
- Previous sibling received phototherapy
- Cephalohematoma or significant bruising
- Exclusive breastfeeding, particularly if nursing is not going well and weight loss is excessive
- East Asian race

**Minor risk factors**
- Predischarge TSB or TcB level in the high intermediate-risk zone
- Gestational age 37–38 wk
- Jaundice observed before discharge
- Previous sibling with jaundice
- Macrosomic infant of a diabetic mother
- Maternal age ≥25 y
- Male gender

**Decreased risk** (these factors are associated with decreased risk of significant jaundice, listed in order of decreasing importance)
- TSB or TcB level in the low-risk zone (Fig 2)
- Gestational age ≥41 wk
- Exclusive bottle feeding
- Black race
- Discharge from hospital after 72 h

* Race as defined by mother’s description.
TABLE 1  Important Risk Factors for Severe Hyperbilirubinemia

<table>
<thead>
<tr>
<th>Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predischarge TSB or TcB measurement in the high-risk or high-intermediate-risk zone</td>
</tr>
<tr>
<td>Lower gestational age</td>
</tr>
<tr>
<td>Exclusive breastfeeding, particularly if nursing is not going well and weight loss is excessive</td>
</tr>
<tr>
<td>Jaundice observed in the first 24 h</td>
</tr>
<tr>
<td>Isoimmune or other hemolytic disease (eg, G6PD deficiency)</td>
</tr>
<tr>
<td>Previous sibling with jaundice</td>
</tr>
<tr>
<td>Cephalohematoma or significant bruising</td>
</tr>
<tr>
<td>East Asian race</td>
</tr>
</tbody>
</table>

TABLE 2  Hyperbilirubinemia Neurotoxicity Risk Factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isoimmune hemolytic disease</td>
</tr>
<tr>
<td>G6PD deficiency</td>
</tr>
<tr>
<td>Asphyxia</td>
</tr>
<tr>
<td>Sepsis</td>
</tr>
<tr>
<td>Acidosis</td>
</tr>
<tr>
<td>Albumin &lt;3.0 mg/dL</td>
</tr>
</tbody>
</table>

• Use hour-specific nomogram to interpret bili (Maisels 2009, AAP 2004)


FIGURE 2
Nomogram for designation of risk in 2840 well newborns at ≥36 weeks’ gestational age with birth weight of ≥2000 g or ≥35 weeks’ gestational age and birthweight of ≥2500 g based on the hour-specific serum bilirubin values. (Reproduced with permission from Bhutani VK, Johnson L, Sivieri EM. Pediatrics. 1999;103(1):6–14.)

option one

Date and time of birth to closest hour:
2018 June 27 12 am - midnight

Date and time of blood sampling to closest hour:
2018 June 28 12 am - midnight

Total Bilirubin*: mg/dl (US) Submit

option two

Age (hours): (12-146 hours)

Total Bilirubin*: mg/dl (US) Submit

*Note: The default unit of measure for total bilirubin is mg/dl. Please select μmol/L if your bilirubin values are captured in the global standard SI metric units. Bilirubin conversion from US to SI units is 17.1.

Results are based on the Hour-Specific Nomogram for Risk Stratification published in "Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation" (2004) by the AAP journal.
option one

Date and time of birth to closest hour:

2018 June 26 5:00 pm

Date and time of blood sampling to closest hour:

2018 June 28 5:00 am

Total Bilirubin*: 14 mg/dl (US) Submit

option two

Age (hours): (12-146 hours)

Total Bilirubin*: mg/dl (US) Submit

*Note: The default unit of measure for total bilirubin is mg/dl. Please select μmol/L if your bilirubin values are captured in the global standard SI metric units. Bilirubin conversion from US to SI units is 17.1.

Results are based on the Hour-Specific Nomogram for Risk Stratification published in "Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation" (2004) by the AAP journal.

Use

BiliTool is designed to help clinicians assess the risks toward the development of hyperbilirubinemia or "jaundice" in newborns over 35 weeks gestational age.

Required values include the age of the child in hours (between 12-146 hours) and the total bilirubin in either US (mg/dl) or SI (μmol/L) units.

Two entry options are available.
Hour-Specific Nomogram for Risk Stratification

<table>
<thead>
<tr>
<th>Risk zone</th>
<th>Infant age</th>
<th>Total bilirubin</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36 hours</td>
<td>14 mg/dl</td>
<td></td>
</tr>
</tbody>
</table>

Risk zone is one of several risk factors for developing severe hyperbilirubinemia.

Recommended Follow-up

<table>
<thead>
<tr>
<th>Hyperbilirubin Level</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Risk</td>
<td>Evaluate for phototherapy and check TSB in 4-24 hours</td>
</tr>
<tr>
<td>Medium Risk</td>
<td>Evaluate for phototherapy and check TSB in 4-24 hours</td>
</tr>
<tr>
<td>Higher Risk</td>
<td>Evaluate for phototherapy and check TSB in 4-24 hours</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Neurotoxicity Risk Level</th>
<th>Start phototherapy?</th>
<th>Approximate threshold at 36 hours of age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Risk</td>
<td>Yes</td>
<td>13.6 mg/dl</td>
</tr>
<tr>
<td>(&gt;=38 weeks and well)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Risk</td>
<td>Yes</td>
<td>11.7 mg/dl</td>
</tr>
<tr>
<td>(&gt;=38 weeks + neurotoxicity risk factors OR 35 to 37 6/7 weeks and well)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher Risk</td>
<td>Yes</td>
<td>9.6 mg/dl</td>
</tr>
<tr>
<td>(35 to 37 6/7 weeks and neurotoxicity risk factors)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is an option to provide conventional phototherapy in the hospital or at home at TSB levels 2-3 mg/dl (35-50 μmol/L) below those shown. Home phototherapy should not be used in infants with risk factors.

If phototherapy threshold is exceeded, please also review AAP Guidelines for Exchange Transfusion.
Recommendations for Management and Follow-up
Guidelines for phototherapy in hospitalized infants of 35 or more weeks' gestation

- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin.
- Risk factors = isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis, or albumin < 3.0g/dL (if measured)
- For well infants 35-37 6/7 wk can adjust TSB levels for intervention around the medium risk line. It is an option to intervene at lower TSB levels for infants closer to 35 wks and at higher TSB levels for those closer to 37 6/7 wk.
- It is an option to provide conventional phototherapy in hospital or at home at TSB levels 2-3 mg/dL (35-50mmol/L) below those shown but home phototherapy should not be used in any infant with risk factors.

Subcommittee on Hyperbilirubinemia, Pediatrics 2004;114:297-316
Recommendations for Management and Follow-up

**FIGURE 3**
Algorithm providing recommendations for management and follow-up according to predischarge bilirubin measurements, gestation, and risk factors for subsequent hyperbilirubinemia.

- Provide lactation evaluation and support for all breastfeeding mothers.
- Recommendation for timing of repeat TSB measurement depends on age at measurement and how far the TSB level is above the 95th percentile (Fig 2). Higher and earlier initial TSB levels require an earlier repeat TSB measurement.
- Perform standard clinical evaluation at all follow-up visits.
- For evaluation of jaundice see 2004 AAP guideline.¹
- Table 3. ² Fig 2. ³ Fig 1. ⁴ In hospital or as outpatient. ⁵ Follow-up recommendations can be modified according to level of risk for hyperbilirubinemia; depending on the circumstances in infants at low risk, later follow-up can be considered.

Written and verbal info to parents at discharge explaining jaundice and need to monitor for (AAP, 2004)
SUMMARY

- TSB or TcB if any jaundice noted visually (AAP, Keren) to be initiated by the nurse (NANN 2010)

- Use of clinical risk factors and predischarge bili to predict risk of hyperbilirubinemia (Maisels)

- Universal predischarge bilirubin screening-TSB or TcB (Maisels)

- Use hour-specific nomogram to interpret bili (Maisels 2009, AAP 2004)

- Written and verbal info to parents at discharge explaining jaundice and need to monitor for (AAP 2004)

- Follow up post discharge per algorithm (Maisels 2009)
Case 1

- G1P0
- 36 5/7 wks gestation
- Hispanic
- PROM
- Apgars 7 & 9
- AB pos
- SVD after 20 hour labor with oxytocin
- Formula feeding
- Universal bili screen at 24h with newborn screen was 10.6 (TSB)

**FIGURE 2**
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Guidelines for phototherapy in hospitalized infants of 35 or more weeks' gestation

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Subcommittee on Hyperbilirubinemia, Pediatrics 2004;114:297-316
Case 2

G4P3
39 weeks gestation
Caucasian
SVD after 2 hour labor
O pos
Apgars 9 & 9
Breastfeeding well

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Post Discharge:

- ER visit 48 hours after discharge (72 hours of life) for poor feeding – PE Jaundiced

- Bilirubin 24
Questions Can be Directed to Peggy Brown or Ann Anderson Berry through NPQIC.org