Objectives

1) History of hyperbilirubinemia screening
2) Physiology of Bilirubin clearance
3) Physiologic vs Pathologic Hyperbilirubinemia.
4) Treatment for Hyperbilirubinemia
5) AAP recommended guidelines
History of Screening

Icterus Neonatorum 1885

Icterus gravis showed high recurrence within families early 1900’s

Discovery of Rh group of red cell antigens 1940

Research on hemolytic disease of the newborn 1940-1950’s

Rhogam 1968

Rh erythroblastosis fetalis becomes rare 1970’s

Phototherapy intervention of choice 1980’s

Official AAP guidelines 2004
Jaundice in newborns

Jaundice:
Yellow/orange discoloration of the skin and sclera caused by an elevated bilirubin level

**Not reliable**

Bilirubin:
Metabolic end product of RBC breakdown

Evaluate Jaundice in Good Lighting
Extent of jaundice

Grade I: Face and neck only
Grade II: Chest and back
Grade III: Abdomen below umbilicus to knees
Grade IV: Arms and legs below knees
Grade V: Hands and feet
Bilirubin Synthesis and Transport

PRODUCTION

Red blood cells (Hemolysis) → Heme → Biliverdin → Bilirubin

Fe⁺ CO

Biliverdin reductase

Brain

Free bilirubin (*)
Bilirubin Metabolism, Clearance and Excretion

✓ Some bilirubin binds to albumin and transported directly to the liver

✓ Enterohepatic circulation
Bilirubin production, metabolism, and excretion

**PRODUCTION**

- **Red blood cells (Hemolysis)**
  - Heme oxygenase
  - Biliverdin reductase
  - Biliverdin
  - Bilirubin

- **Hemoproteins**
  - Catalase
  - Peroxidase
  - Cytochromes
  - Myoglobin

- **Albumin**

- **Bilirubin-albumin**

- **Bilirubin-ligandin**

- **Gall bladder**

- **Liver**

- **Bile duct**

- **Enterohepatic recirculation of bilirubin**

**EXCRETION**

- **Conjugated bilirubin**
  - Beta-glucuronidase
  - Unconjugated bilirubin

- **Bacterial decomposition**

- **Sterocobilinogen (excreted in stool)**
- **Urobilinogen (excreted in urine)**

Which of the following is not true?

Bilirubin binds to albumin.  
Bilirubin is water soluble.  
Bilirubin is excreted in the stool.
Hyperbilirubinemia

Too much Bilirubin In the bloodstream
## Hyperbilirubinemia

<table>
<thead>
<tr>
<th>PHYSIOLOGIC unconjugated</th>
<th>PATHOLOGIC unconjugated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaundice after 24-48hr of life</td>
<td>Jaundice within the first 24hr</td>
</tr>
<tr>
<td>Requires no treatment</td>
<td>Evaluation &amp; treatment</td>
</tr>
<tr>
<td>Peak: Day of life 3 in term, Day of life 5-6 in preterm</td>
<td>Bili increases &gt;5mg/dL each day</td>
</tr>
<tr>
<td>Resolved by 14 days of life</td>
<td>Jaundice lasting longer than 14 days</td>
</tr>
<tr>
<td>Normal infant appearance</td>
<td>Anemic, discolored stools or urine</td>
</tr>
<tr>
<td>Normal physiology: Increased RBC destruction, Reduced hepatic uptake, Enterohepatic reabsorption &amp; Decreased clearance</td>
<td>Cause varies, any process that is exaggerated</td>
</tr>
</tbody>
</table>
## Causes of unconjugated hyperbilirubinemia in neonates

<table>
<thead>
<tr>
<th>Increased bilirubin production</th>
<th>Increased enterohepatic circulation</th>
<th>Decreased clearance of unconjugated bilirubin</th>
<th>Metabolic conditions</th>
<th>Inborn errors of metabolism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemolysis (immune-mediated, heritable)</td>
<td>Insufficient breast milk/feeding</td>
<td>Prematurity</td>
<td>Hypothyroidism</td>
<td>Galactosemia</td>
</tr>
<tr>
<td>Extravasation (cephalohematoma)</td>
<td>Pyloric stenosis</td>
<td>G6PD deficiency</td>
<td>Hypopituitarism</td>
<td>Gilbert syndrome</td>
</tr>
<tr>
<td>Polycythemia</td>
<td>Bowel obstruction</td>
<td></td>
<td></td>
<td>Crigler-Najjar syndrome (I and II)</td>
</tr>
<tr>
<td>Sepsis</td>
<td></td>
<td></td>
<td></td>
<td>Breast milk jaundice due to other bilirubin UGT1A1 mutations</td>
</tr>
<tr>
<td>Disseminated intravascular coagulation</td>
<td></td>
<td></td>
<td></td>
<td>Tyrosinemia</td>
</tr>
<tr>
<td>Macrosomic infants of diabetic mothers</td>
<td></td>
<td></td>
<td></td>
<td>Hypermethioninemia</td>
</tr>
</tbody>
</table>

G6PD, glucose-6-phosphate dehydrogenase; UGT1A1, uridine diphosphate-glucuronosyltransferase, family 1, polypeptide A1.
How do we test?

- Gold standard is (TSB) Total Serum Bilirubin
- Heelstick is sufficient: 0.3mL **check what your facility requires**
- Plot on age-specific nomogram
- Rate of rise
- Mom and Baby blood type. If coombs is positive that means there is an antibody-mediated hemolysis
Nomogram of hour-specific serum or plasma total bilirubin (TB) concentration in healthy term and near-term newborns

Risk zones are designated according to percentile: high (TB ≥ 95th), high intermediate (95th > TB ≥ 75th), low intermediate (75th > TB ≥ 40th), and low (TB < 40th). Infants with values in the high risk zone are at increased risk for the development of clinically significant hyperbilirubinemia requiring intervention.

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Hour-Specific Nomogram for Risk Stratification

| Infant age | 33 hours |
| Total bilirubin | 5.8 mg/dl |

Risk zone: Low Risk

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

Recommended Follow-up

<table>
<thead>
<tr>
<th>Hyperbilirubinemia Risk Level</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Risk (≥ 38 weeks and well)</td>
<td>If discharge age &lt;72 hours, follow-up according to age and other clinical concerns</td>
</tr>
<tr>
<td>Medium Risk (≥38 weeks + hyperbilirubinemia risk factors OR 35 to 37 6/7 weeks and well)</td>
<td>If discharge age &lt;72 hours, follow-up within 48-72 hours</td>
</tr>
<tr>
<td>Higher Risk (35 to 37 6/7 weeks and hyperbilirubinemia risk factors)</td>
<td>If discharge age &lt;72 hours, follow-up within 48 hours</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Neurotoxicity Risk Level</th>
<th>Start phototherapy?</th>
<th>Approximate threshold at 33 hours of age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Risk (≥ 38 weeks and well)</td>
<td>No</td>
<td>13.1 mg/dl</td>
</tr>
<tr>
<td>Medium Risk (≥38 weeks + neurotoxicity risk factors OR 35 to 37 6/7 weeks and well)</td>
<td>No</td>
<td>11.3 mg/dl</td>
</tr>
</tbody>
</table>

Hyperbilirubinemia Risk Factors

- TSB/TcB in high-risk zone
- Jaundice in first 24 hours
- ABO incompatibility with positive direct Coombs, known hemolytic disease, or elevated ETCO
- Gestational age 35-36 weeks
- Prior sibling had phototherapy
- Cephalohematoma or bruising
- Exclusive breastfeeding, esp. with poor feeding or weight loss
- East Asian Race

Neurotoxicity Risk Factors

- Isoimmune Hemolytic Disease
- G6PD deficiency
- Asphyxia
- Significant lethargy
- Temperature Instability
- Sepsis
- Acidosis
- Albumin < 3.0 g/dL
Bhutani Nomogram

High Risk

Low Risk

HTTPS://WWW.NEJM.ORG/DOI/FULL/10.1056/NEJMCT0708376
This baby is in the low risk category.
<table>
<thead>
<tr>
<th>Date-Time</th>
<th>Bili</th>
<th>Age (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/29/20 04:00</td>
<td>10(Lab)</td>
<td>32.0 hours</td>
</tr>
<tr>
<td>6/28/20 20:00</td>
<td>8(Lab)</td>
<td>24.0 hours</td>
</tr>
<tr>
<td>6/28/20 08:00</td>
<td>5(Lab)</td>
<td>12.0 hours</td>
</tr>
<tr>
<td>6/27/20 21:00</td>
<td>1.0(Lab)</td>
<td>1.0 hours</td>
</tr>
</tbody>
</table>

Rate of Rise = Current Bili – Previous Bili

Number of hours between labs
Gestational Age ≥ 38 wk + No Risk Factors

Predischarge total serum bilirubin=10.0

High Risk

Evaluate for phototherapy
Check total serum bilirubin in 4-24 hr

Follow-up within 2 days
Evaluate total serum bilirubin or transcunaneous bilirubin at follow-up

High-Intermediate Risk

Follow-up within 2 - 3 days
Follow-up at Physician’s Discretion

Last bili < 72 hr?

YES

Follow-up at Physician’s Discretion

NO

Follow-up at Physician’s Discretion

Low Intermediate Risk

Long-term follow-up

Follow-up at Physician’s Discretion

Low Risk

Gestational age:
- 35-37 6/7 weeks
- ≥ 38 weeks

ADDITIONAL RISK FACTORS FOR SEVERE HYPERBILIRUBINEMIA AFTER DISCHARGE
- Isoimmune hemolytic disease
- Cephalohematoma/significant bruising
- Treatment of ie with < 10% weight loss
- Hemolytic anemia
- Sibling with jaundice
- Fort Asian race
- G6PDase deficiency
How else do we test?

- Transcutaneous Bilirubin (TcB)
- Use the forehead or sternum
- Do not use on bruises, birthmarks or excessively hairy skin
- Do not use if baby is undergoing phototherapy
- May be affected by skin pigmentation
TcB nomogram for assessing the risk of subsequent significant hyperbilirubinemia in healthy term and near-term newborns. The high-risk zone is defined by the track of TcB values with positive LR of >10 and the low-risk zone by the track of TcB values with negative LR of <0.1. The minimal-risk demarcator track (negative LR of 0) is also presented (dotted line). The nomogram was developed by using a total of 10382 TcB measurements from 2039 neonates with gestational ages of ≥35 weeks and birth weights of ≥2000 g.
Bilirubin Level: 4 (ex: 4.6)
Age In Hours: 48 (6 - 96 hours)
Birthdate: 06/23 @ 23:00

Click to calculate risk level
Which of the following is true?

A. TcB is the gold standard for bilirubin evaluation.

B. Any age specific nomogram is acceptable for TSB and TcB.

C. Rate of rise greater than 0.2mg/dL/hr is abnormal.

D. I'm not paying attention.
Classification of Hyperbilirubinemia

- **Benign neonatal hyperbilirubinemia:** transient, occurs in almost every newborn “physiologic jaundice”

- **Significant hyperbilirubinemia:** infants ≥ 35 weeks with TSB >95th percentile on nomogram

- **Severe neonatal hyperbilirubinemia:** a TSB >25mg/dL and increased risk for BIND

- **Extreme hyperbilirubinemia:** TSB >30mg/dL associated with increased risk for BIND
Bilirubin-induced Neurologic Dysfunction (BIND)

- Acute Bilirubin Encephalopathy (ABE)
  - Significant lethargy
  - Hypotonia
  - Poor sucking
  - High-pitched Cry

- Chronic Bilirubin Encephalopathy (CBE)
  - Cerebral Palsy
  - Abnormal gaze
  - Hearing loss
  - Dental enamel hypoplasia

1 in 10,000

1 in 40,000
<table>
<thead>
<tr>
<th>BreastMILK Jaundice</th>
<th>BreastFEEDING Jaundice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset 4-7 days</td>
<td>Onset 2-4 days</td>
</tr>
<tr>
<td>May persist for up to 2 months</td>
<td>Self-limiting as maternal milk supply increases</td>
</tr>
<tr>
<td>1 in 200 infants</td>
<td>1 in 10 infants</td>
</tr>
<tr>
<td>Exaggerated physiologic jaundice related to substances in maternal breastmilk</td>
<td>Related to low or inadequate enteral intake</td>
</tr>
<tr>
<td>No treatment</td>
<td>More common in Late Preterm Infant</td>
</tr>
</tbody>
</table>
Acute Bilirubin Encephalopathy is reversible.
## Factors That Increase Risk of Hyperbili

<table>
<thead>
<tr>
<th>Neurotoxicity risk factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isoimmune hemolytic disease</td>
</tr>
<tr>
<td>G6PD deficiency</td>
</tr>
<tr>
<td>Asphyxia</td>
</tr>
<tr>
<td>Significant lethargy</td>
</tr>
<tr>
<td>Temperature instability</td>
</tr>
<tr>
<td>Sepsis</td>
</tr>
<tr>
<td>Acidosis</td>
</tr>
<tr>
<td>Albumin &lt;3 g/dL</td>
</tr>
</tbody>
</table>

G6PD, glucose-6-phosphate dehydrogenase; TcB, transcutaneous bilirubin; TSB, total serum bilirubin.
### Major risk factors

- PredischARGE T/B or TcB level in the high-risk zone
- Jaundice observed in the first 24 hours
- Blood group incompatibility with positive direct antiglobulin test, other known hemolytic disease (e.g., G6PD deficiency), elevated ETCOC
- Gestational age 35 to 36 weeks
- 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 T/B or TcB level in the high intermediate-risk zone
- Gestational age 37 to 38 weeks
- Jaundice observed before discharge
- Previous sibling with jaundice
- Macrosomic infant of a diabetic mother
- Maternal age 25 years
- Male gender

### Decreased risk (these factors are associated with decreased risk of significant jaundice, listed in order of decreasing importance)

- T/B or TcB level in the low-risk zone
- Gestational age ≥41 weeks
- Exclusive bottle feeding
- Black race
- Discharge from hospital after 72 hours
The late preterm infant you are taking care of is expected to discharge today and the mother is exclusively breastfeeding. The infant only has a 7% weight loss from birthweight. Which of the following puts this baby at a high risk for severe hyperbili?

A. The mother is Vegetarian.

B. The step sibling required phototherapy as a newborn.

C. A female infant with a noted caput succedaneum.

D. The mother is Native American and a diabetic.

None of the above
Interventions

- Goal is to intervene based on the probability a baby will develop severe hyperbilirubinemia
  - Phototherapy
  - IVIG
  - Exchange Transfusion

HTTPS://THECONVERSATION.COM/JAUNDICE-IN-NEWBORNS-COULD-BE-AN-EVOLUTIONARY-SAFEGUARD-AGAINST-DEATH-FROM-SEPSIS-97049
Interventions: Phototherapy

- Most common & safe
- It is a treatment with adverse effects
- LED lights, fiberoptic lights, swaddles
- Decreases bilirubin regardless of ethnicity
- Know the number of banks
- Monitor: Temperature, hydration
Interventions: Phototherapy

- Photons are emitted by blue to blue-green light
- Isomerization -> Lumirubin
- Photoisomerization -> quick fix
- Cover eyes and genitals
- When do you stop?
- Bronze baby syndrome

Phototherapy

http://www.parentspowwow.net/jaundice-in-the-newborn-neonatal-jaundice/

How do you know when to treat??

The guidelines refer to the use of intensive phototherapy, which should be used when the total serum bilirubin exceeds the line indicated for each risk category. Risk factors include isoimmune hemolytic diseases, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis, albumin <3 g/dL (if measured) or lower gestational age. Infants are designated as “higher risk” because of the potential negative effects of the listed conditions on albumin binding of bilirubin, the blood-brain barrier, and the susceptibility of the brain cells to damage by bilirubin. Note that these guidelines are based on limited evidence and the levels shown are approximations.

TB: total serum or plasma bilirubin; G6PD: glucose-6-phosphate dehydrogenase.
Interventions: IVIG

- Inconclusive
- Rh and ABO hemolytic disease
- Reduces need for exchange transfusion
- 0.5-1g/kg over 2hr
- Repeat every 12hr PRN

HTTP://AMERICANINFUSIONCENTERS.COM/WP-CONTENT/UPLOADS/2017/03/IVIG.PNG
Interventions: Exchange Transfusion

- Rare, expensive & time consuming
- Trained personnel
- Quickest way to decrease bilirubin
- Consider when
  - Symptomatic for BIND
  - Phototherapy has failed
- Full, partial, double volume
How do you know when to treat??

The dashed lines for the first 24 hours indicate uncertainty due to a wide range of clinical circumstances and a range of responses to phototherapy. Immediate exchange transfusion is recommended if the infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrolisks, opisthotonus, fever, high-pitched cry) or if TB is 25 mg/dL (85 micromol/L) above these lines. Risk factors include immunoheemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, and acidosis. Measure serum albumin and calculate B/A ratio. Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin. If infant is well and 35 to 37 6/7 weeks (medium risk) can individualize TB levels for exchange based on actual gestational age. Note that these suggested levels represent a consensus of most of the committee but are based on limited evidence, and the levels shown are approximations. During birth hospitalization, exchange transfusion is recommended if the TB rises to these levels despite intensive phototherapy. For readmitted infants, if the TB level is above the exchange level, repeat TB measurement every two to three hours and consider exchange if the TB remains above the levels indicated after intensive phototherapy for six hours.

TB: total serum or plasma bilirubin; G6PD: glucose-6-phosphate dehydrogenase; B/A: bilirubin/albumin.

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Exchange Guidelines - Newborns ≥ 35 Weeks Gestation

This baby is in the low risk category.

Current Age

Age (Hours)

Total Bilirubin

TC bilirubin  Total bilirubin  High Risk  Medium Risk  Low Risk
Put the baby next to the window?

- Sunlight does include the effective blue-green light wavelength and can lower levels of TSB
- UV radiation
- Risk of sunburn and hyperthermia, hypovolemia and long term skin malignancies
- Filtered light using special window tinting films may be a reasonable and cost-effective alternative
You can give a baby water or glucose water to help bring the bilirubin down.
AMERICAN ACADEMY OF PEDIATRICS

CLINICAL PRACTICE GUIDELINE

Subcommittee on Hyperbilirubinemia

Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation
1. Promote and support successful breastfeeding.

- Early and frequent breastfeeding 8-12 times per day
- Goal of 4-6 wet diapers per day
- Recommends against routine formula supplementation
AAP Guideline 2

2. Establish nursery protocols for the identification and evaluation of hyperbilirubinemia.

- Receive ongoing assessments
- Blood typing on all women
  - Baby blood typing on all O mothers and Rh negative
- Jaundice assessment every time VS are taken at least every 8-12hr
AAP Guideline 3

3. Measure the total serum bilirubin (TSB) or transcutaneous bilirubin (TcB) level on infants jaundiced in the first 24 hours.

- Jaundice in the first 24hr is abnormal
- Recommended lab guideline
### TABLE 1. Laboratory Evaluation of the Jaundiced Infant of 35 or More Weeks’ Gestation

<table>
<thead>
<tr>
<th>Indications</th>
<th>Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaundice in first 24 h</td>
<td>Measure TcB and/or TSB</td>
</tr>
<tr>
<td>Jaundice appears excessive for infant’s age</td>
<td>Measure TcB and/or TSB</td>
</tr>
<tr>
<td>Infant receiving phototherapy or TSB rising rapidly (ie, crossing percentiles [Fig 2]) and unexplained by history and physical examination</td>
<td>Blood type and Coombs’ test, if not obtained with cord blood</td>
</tr>
<tr>
<td>TSB concentration approaching exchange levels or not responding to phototherapy</td>
<td>Complete blood count and smear</td>
</tr>
<tr>
<td>Elevated direct (or conjugated) bilirubin level</td>
<td>Measure direct or conjugated bilirubin</td>
</tr>
<tr>
<td></td>
<td>It is an option to perform reticulocyte count, G6PD, and ETCO₂, if available</td>
</tr>
<tr>
<td></td>
<td>Repeat TSB in 4–24 h depending on infant’s age and TSB level</td>
</tr>
<tr>
<td>Jaundice present at or beyond age 3 wk, or sick infant</td>
<td>Perform reticulocyte count, G6PD, albumin, ETCO₂, if available</td>
</tr>
<tr>
<td></td>
<td>Do urinalysis and urine culture. Evaluate for sepsis if indicated by history and physical examination</td>
</tr>
<tr>
<td></td>
<td>Total and direct (or conjugated) bilirubin level</td>
</tr>
<tr>
<td></td>
<td>If direct bilirubin elevated, evaluate for causes of cholestasis</td>
</tr>
<tr>
<td></td>
<td>Check results of newborn thyroid and galactosemia screen, and evaluate infant for signs or symptoms of hypothyroidism</td>
</tr>
</tbody>
</table>
AAP Guideline 4

4. Recognize that visual estimation of the degree of jaundice can lead to errors, particularly in darkly pigmented infants.

✔ You can’t guess a TSB level with your eyes
5. Interpret all bilirubin levels according to the infant’s age in hours.
AAP Guideline 6 & 7

6. Recognize that infants at less than 38 weeks’ gestation, particularly those who are breastfed, are at higher risk of developing hyperbilirubinemia and require closer surveillance and monitoring.

7. Perform a systematic assessment on all infants before discharge for the risk of severe hyperbilirubinemia.

✓ Every newborn should be assessed for risks especially if discharge before 72hr
TABLE 2. Risk Factors for Development of Severe Hyperbilirubinemia in Infants of 35 or More Weeks’ Gestation (in Approximate Order of Importance)

<table>
<thead>
<tr>
<th>Major risk factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predischage TSB or TcB level in the high-risk zone (Fig 2)\textsuperscript{25,31}</td>
</tr>
<tr>
<td>Jaundice observed in the first 24 h\textsuperscript{30}</td>
</tr>
<tr>
<td>Blood group incompatibility with positive direct antiglobulin test, other known hemolytic disease (eg, G6PD deficiency), elevated ET\textsubscript{CO}_2</td>
</tr>
<tr>
<td>Gestational age 35–36 wk\textsuperscript{39,40}</td>
</tr>
<tr>
<td>Previous sibling received phototherapy\textsuperscript{40,41}</td>
</tr>
<tr>
<td>Cephalohematoma or significant bruising\textsuperscript{39}</td>
</tr>
<tr>
<td>Exclusive breastfeeding, particularly if nursing is not going well and weight loss is excessive\textsuperscript{39,40}</td>
</tr>
<tr>
<td>East Asian race\textsuperscript{39}\textsuperscript{*}</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minor risk factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predischage TSB or TcB level in the high intermediate-risk zone\textsuperscript{25,31}</td>
</tr>
<tr>
<td>Gestational age 37–38 wk\textsuperscript{39,40}</td>
</tr>
<tr>
<td>Jaundice observed before discharge\textsuperscript{40}</td>
</tr>
<tr>
<td>Previous sibling with jaundice\textsuperscript{40,41}</td>
</tr>
<tr>
<td>Macrosomic infant of a diabetic mother\textsuperscript{42,43}</td>
</tr>
<tr>
<td>Maternal age $\geq$ 25 y\textsuperscript{39}</td>
</tr>
<tr>
<td>Male gender\textsuperscript{39,40}</td>
</tr>
</tbody>
</table>

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)\textsuperscript{25,31}                                |
| Gestational age $\geq$ 41 wk\textsuperscript{39}                                                      |
| Exclusive bottle feeding\textsuperscript{39,40}                                                       |
| Black race\textsuperscript{38}\textsuperscript{*}                                                     |
| Discharge from hospital after 72 h\textsuperscript{40,44}                                            |

\textsuperscript{*} Race as defined by mother’s description.
AAP Guideline 8

8. Provide parents with written and verbal information about newborn jaundice.

NEWBORN JAUNDICE

Newborn jaundice is when your baby’s skin and the white parts of his eyes look yellow. It’s caused by the build-up of a substance in the blood called bilirubin. Newborn jaundice is very
AAP Guideline 9

9. Provide appropriate follow-up based on the time of discharge and the risk assessment.

☑ All infants should be examined by a qualified healthcare professional in the first few days after discharge

☑ Delay discharge until appropriate follow up is ensured
10. Treat newborns, when indicated, with phototherapy or exchange transfusion.

- Indirect versus direct hyperbilirubinemia
- Admit to nursery, NICU or pediatric unit


