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Ready, Set, Glow

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I have no disclosures

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Objectives

- Define the underlying physiologic processes that place newborn infants at risk for hyperbilirubinemia.
- Recognize the neurotoxicity risk factors for hyperbilirubinemia.
- Recognize when to initiate phototherapy or escalate care based on the new AAP Hyperbilirubinemia Clinical Practice Guidelines.
- Determine the appropriate management of newborns treated for hyperbilirubinemia.
- Determine when newborns should follow up based on nursery discharge bilirubin levels.

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What is bilirubin?

- Bilirubin is the bi-product of break down of red blood cells.
  - Unconjugated bilirubin (indirect bilirubin) → is lipid soluble and can cross the BBB
    - Bound to albumin and transported to the liver
    - It must be conjugated to be excreted in the bile, urine or stool.
  - Conjugated bilirubin (direct bilirubin) → bile duct system and goes into the intestines as bile acids
    - Excreted in stool (giving it color)
    - 10% converts back to unconjugated bilirubin and is reabsorbed back into the system (enterohepatic recirculation)

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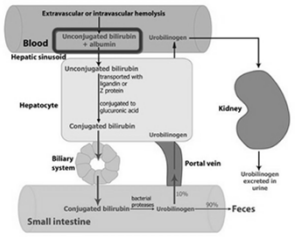
Bilirubin Metabolism



Neonatal Jaundice | PPT (slideshare.net)

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Causes of Newborn Jaundice

- increase in enterohepatic circulation
- decrease in the clearance of bilirubin
- decrease in conjugation and hepatic uptake
- impaired bile flow
- increase in production
- premature infants

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Newborns

- Have a higher hematocrit than adults
- total increase in red blood cells (RBC)
- immature bilirubin metabolism process through the liver
- shorter RBC life span

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Hyperbilirubinemia

- > 80% of newborns will have some degree of jaundice.
- Careful monitoring of all newborns are essential, because high bilirubin concentrations can cause acute bilirubin encephalopathy and kernicterus.

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Kernicterus

- Is a permanent disabling neurologic condition that may cause:
  - choreoathetoid cerebral palsy
  - upward gaze paresis
  - enamel dysplasia of deciduous teeth
  - sensorineural hearing loss
  - characteristic findings on brain MRI
- Kernicterus is a never event.

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Hyperbilirubinemia Guidelines Timeline (2004)

- AAP guideline for the management and prevention of hyperbilirubinemia in newborns >/= 35 weeks gestation.
  - promote and support successful breastfeeding
  - perform a systematic assessment before discharge for the risk of severe hyperbilirubinemia
  - provide early and focused follow-up based on the risk assessment
  - treat newborns with phototherapy or exchange transfusion to prevent the development of severe hyperbilirubinemia and, possibly, bilirubin encephalopathy (kernicterus)

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Timeline (2009)

- AAP published Clarifications to the 2004 guidelines
  - Distinguished between hyperbilirubinemia **severe** risk factors and hyperbilirubinemia **neurotoxic** risk factors.
  - Recommended universal predischarge bilirubin screening (TcB or TSB)
    - Linked to recommendations for follow up.
  - Through predischarge screening a reduction in a TSB level of 25mg/ dL would occur, likely by increasing the use of phototherapy.
  - Hazardous bilirubin was defined as >/= 30 mg/dL

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Timeline (2022)

- Raised the phototherapy threshold slightly for all gestational ages (still conservative measures)
- Revised the risk assessment approach
- Rapidly address elevated bilirubins concentrations – defined as escalation of care.

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2022 Hyperbilirubinemia Guideline

- Updates and replaces the 2004 American Academy of Pediatrics (AAP) clinical practice guideline
- Prevention and Management of hyperbilirubinemia in the newborn infant ≥35 weeks' gestation and includes 25 Key Action Statements (KAS):
  - Prevention
  - Risk assessment
  - Monitoring
  - Treatment

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Prevention of Hyperbilirubinemia

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Prevention

- Begins in pregnancy
  - ACOG recommends all pregnant women be screened
    - ABO blood group
    - Rh(D) type
    - Antibody screen to determine the need for Rh(D) immunoglobulin (RhIG)
  - Maternal screening and treating women at risk for developing antibodies to red cell antigens will assess the potential for isoimmune hemolytic disease of the newborn.

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KAS 1

If the **Maternal Ab** screen is **positive** or **unknown** because the mother did not have prenatal antibody screening

- Obtain the following labs on the newborn as soon as possible after birth:
  - Direct antiglobulin test (DAT)
  - Blood type

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Direct antiglobulin test (DAT)

- Assists in identifying newborns at risk for hyperbilirubinemia due to hemolysis.
  - DAT-negative newborns may be managed with usual care.
  - Mothers who received RhIG can have a positive antibody screen for anti-Rh(D)
    - This can also cause a + DAT (anti-Rh[D]) in the newborn but does not cause hemolysis.
    - If a newborn's DAT is known to be + only to anti-Rh(D) because the mother received RhIG during pregnancy and the mother was known not to have Rh(D) antibodies before receiving RhIG, the newborn can be treated as if the newborn is DAT negative.

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Direct antiglobulin test (DAT)

- Any newborn with a + DAT attributable to an Ab other than anti-Rh(D) following maternal receipt of RhIG should be considered DAT +.
- If the maternal blood type is Rh(D)–, the Rh type of the newborn should be determined to assess the need for administration of RhIG to the mother.
- If the maternal blood is O+ and the maternal antibody screen is negative,
  - it is an option to test the cord blood for the newborn's blood type and/or DAT.
  - Determining the newborn's blood type or DAT is not necessary if bilirubin surveillance and risk assessment follows this clinical practice guideline and appropriate follow-up after discharge is arranged.
  - Otherwise, this testing should be done.

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Breastfeeding

- Exclusive breastfeeding and hyperbilirubinemia are strongly associated.
- Jaundice in breastfed newborns falls into 2 main categories
  - **Suboptimal intake**
    - typically peaks on days 3 to 5 after birth and is frequently associated with excess weight loss.
    - Breastfeeding fewer than 8 times per day
    - Low milk and low caloric intake contribute to decreased stool frequency and increased enterohepatic circulation of bilirubin.
  - **Breast milk**
    - Adequate human milk intake and weight gain
    - This cause of prolonged unconjugated hyperbilirubinemia
    - Can last up to 3 months, is almost always nonpathologic and not associated with direct or conjugated hyperbilirubinemia.

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KAS 2

- Oral supplementation with water or dextrose water **should not** be provided to prevent hyperbilirubinemia or decrease bilirubin concentrations.
  - Breastfeeding support for all mothers and breast milk feeding within the first hour after birth with frequent feeding on demand (minimally 8 x's in 24 hours).
  - Breastfed newborns who are adequately hydrated should not routinely receive supplementation with commercially available infant formula.
  - Shared decision making should be used when discussing the risks and benefits regarding a temporary need for supplementation with donor breast milk or formula.

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Identifying Risk Factors for Hyperbilirubinemia

- Lower gestational age
- Jaundice in the first 24 hr after birth
- Predischarge transcutaneous bilirubin (TcB) or total serum bilirubin (TSB) close to the phototherapy threshold (PTT)
- Hemolysis from any cause
  - rapid rate of increase in the TSB or TcB of >0.3 mg/dL/hr in the 1st 24 h or >0.2 mg/dL/hr thereafter.
- Phototherapy (PT) before discharge
- Parent or sibling requiring PT or exchange transfusion
- Family hx or genetic ancestry suggestive of inherited RBC disorders: (G6PD) deficiency
- Exclusive breastfeeding with suboptimal intake
- Scalp hematoma or significant bruising
- Down syndrome
- Macrosomia in an infant of a diabetic mother

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Glucose-6-phosphate dehydrogenase (G6PD)

- X-linked recessive enzymopathy
- One of the most important causes of hazardous hyperbilirubinemia leading to kernicterus in the US and across the globe
- Immigration and intermarriage have increased the incidence of G6PD in the United States.
- Identifying NBs with this disorder is a challenge.
- Most infants do not have a family history
- More likely to receive PT before hospital discharge
  - probably due to increased bilirubin production and decreased conjugation
- Greater risk of readmission and retreatment.
- Severe hyperbilirubinemia such as an elevated TSB in a formula-fed infant or late-onset jaundice, should raise the possibility of G6PD deficiency.

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G6PD

- Genetic ancestry (prevalent in Sub-Saharan Africa, Middle East, Mediterranean, Arabian Peninsula, and Southeast Asia) can be helpful in predicting risk.
  - 13% of African American males and about 4% of African American females have G6PD deficiency.
- An infant with G6PD deficiency can develop a sudden and extreme increase in TSB that may be hard to anticipate or prevent.
- Even after what appears to be an acute hemolytic event, there may be little or no laboratory evidence of hemolysis.
- It is important for clinicians to recognize that measuring the G6PD activity during or soon after the hemolytic event or after an exchange transfusion can lead to a falsely normal result.
- If G6PD deficiency is strongly suspected but the measurement of G6PD activity is normal or close to normal, the G6PD activity should be measured at least 3 months later.

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Raise suspicion of G6PD

- Severe hyperbilirubinemia
- Atypical development of hyperbilirubinemia
  - Elevated TsB in a formula fed infant
  - Late onset jaundice

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Identify the Need for Treatment

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KAS 3

- Use a TSB as the definitive test to guide PT and escalation-of-care decisions, including exchange transfusion.
  - Decisions to initiate PT or escalate care are guided by the gestational age, **the hour-specific TSB**, and the presence of risk factors for bilirubin **neurotoxicity**
    - **Neurotoxic risk factors** lower the threshold for treatment with PT and the level at which care should be escalated.

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Neurotoxic Risk factors

- Gestational age <38 weeks (new graphs are GA specific)
- **Isoimmune hemolytic disease (+DAT, G6PD deficiency or other hemolytic conditions)**
- Albumin <3 g/dL (recommend to obtain if meets escalation of care threshold)
- Sepsis
- Significant clinical instability in the previous 24 hrs.

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Visual Assessments

- Jaundice progresses cephalocaudally.
- Visual assessments alone are not reliable to determine a newborn's bilirubin level.
- Visual estimation may routinely be used in outpatient settings on a 3 or more-day old to guide decisions about obtaining a TcB or TSB. (lower risk newborns)

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KAS 4

- All infants should be **visually assessed** for jaundice at least every 12 hours following delivery until discharge**. TSB or TcB** should be measured as soon as possible for infants noted to be **jaundiced <24 hours after birth**
  - Clinical jaundice identified before 24 hrs of age is most likely to be due to a hemolytic process.
  - This recommendation for visual assessment does not replace the need to **obtain at least 1 screening TSB or TcB before discharge.**

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Transcutaneous Bilirubin (TcB) Levels

- There are 2 devices that have been studied

  - They measure the yellowness of reflected light transmitted from the skin and use an algorithm to predict the TSB level from the objective measurement of skin color.
  - The TcB measurements are a valid and reliable screening test to identify infants who require a TSB measurement.
  - Decrease blood draws and decreased the likelihood of having a TSB ≥ 20mg/dL
- TSB generally within 3 mg/dL of the TcB among newborn infants with TSB concentrations <15 mg/dL.

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KAS 5

- The TcB or TSB should be measured between 24 and 48 hours after birth or before discharge if that occurs earlier.
  - Blood for TSB can be obtained at the time it is collected for newborn screening tests to avoid an additional heel stick.
  - Infants born at home should also have bilirubin testing between 24 and 48 hours after birth.

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KAS 6

- TSB should be measured if the TcB exceeds or is within 3 mg/dL of the PT treatment threshold or if the TcB is ≥15 mg/dL.

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KAS 7

- If more than 1 TcB or TSB measure is available, the rate of increase may be used to identify infants at higher risk of subsequent hyperbilirubinemia. A rapid rate of increase (≥0.3 mg/dL/hr in the 1st 24 hrs or ≥0.2 mg/dL/hr thereafter) is exceptional-and suggests hemolysis. In this case, perform a DAT if not previously done.
  - If available, measurement of end-tidal carbon monoxide production, corrected for ambient carbon monoxide (ETCOc), is a potentially useful method for quantifying hemolysis. Carbon monoxide is produced in equimolar amounts with bilirubin when heme is catabolized to bilirubin.

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KAS 8

- If appropriate follow-up cannot be arranged for an infant recommended to have an outpatient follow-up bilirubin measure, discharge may be delayed.
  - Among infants with TSB concentrations below the PTT, the potential need for future PT or escalation of care increases the closer the TSB is to the PTT.
  - Once a spontaneous decline in TcB or TSB (ie, not associated with PT) over at least 6 hours has been documented, the risk of subsequent hyperbilirubinemia is low and it is not necessary to obtain additional bilirubin measurements unless there are other worrisome signs, such as worsening jaundice or acute illness.

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KAS 9

- For breastfed infants who are still jaundiced at 3 to 4 weeks of age, and for formula-fed infants who are still jaundiced at 2 weeks of age, the total and direct-reacting (or conjugated) bilirubin concentrations should be measured to identify possible pathologic cholestasis.
  - **Prolonged jaundice**
    - Review the newborn screening results(eg, galactosemia, hypothyroidism, tyrosinemia) can lead to persistent jaundice.
    - Formula fed infants or breastfed infants with direct or conjugated hyperbilirubinemia, consultation with a gastroenterologist or other expert is recommended.

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Treatment of Hyperbilirubinemia

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Phototherapy

- Decreases bilirubin concentrations through a variety of photochemical reactions that allow the bilirubin to be more easily excreted.
- Effectiveness of PT is dependent on the intensity of PT, total surface area of the infant exposed.
- No standard method of PT delivery (available equipment is variable)
- Intense PT requires a narrow-spectrum LED blue light with an irradiance of at least 30 μW/cm^2 per nm at a wavelength around 475 nm. Light outside the 460 to 490 nm range provides unnecessary heat and potentially harmful wavelengths. The advantage of intensive PT is that it can quickly lower the TSB and should shorten the duration of treatment.

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Phototherapy Goal

- Decrease the likelihood of further increases in the TSB concentration that would lead to a need for escalation of care or exchange transfusion.
- The recommended PTTs are far below those at which overt acute bilirubin neurotoxicity or kernicterus occurs
- PT should not be used solely with a goal of preventing subtle adverse neurodevelopmental findings, because the literature linking subtle abnormalities with bilirubin is conflicting; there is no evidence that PT improves or prevents any of these outcomes and there is some evidence that PT may lead to a small increase in the risk of subsequent childhood epilepsy (see accompanying technical report).
- The committee believes that the benefit of PT exceeds the small potential risk of epilepsy when the **TSB is at or above** the PTT.

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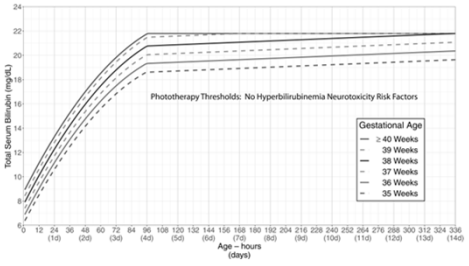
American Academy of Pediatrics

From: **Clinical Practice Guideline Revision: Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation**

Pediatrics. 2022;150(3). doi:10.1542/peds.2022-058859



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Phototherapy Threshold

- Gestational age and age in hours for infants with no recognized hyperbilirubinemia neurotoxicity risk factors other than gestational age.
- These thresholds are based on expert opinion rather than strong evidence on when the potential benefits of PT exceed its potential harms.
- Use total serum bilirubin concentrations; do not subtract direct-reacting or conjugated bilirubin from the total serum bilirubin.
- Infants <24 hours old with a TSB at or above the PTT are likely to have a hemolytic process and should be evaluated for hemolytic disease. .

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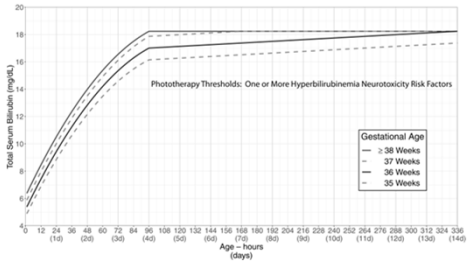

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PTT Neurotoxic Risk Factors

- Gestational age and age in hours for infants with any recognized hyperbilirubinemia neurotoxicity risk factors **other than** gestational age.
- Hyperbilirubinemia neurotoxicity risk factors include
  - gestational age <38 weeks
  - albumin <3.0 g/dL
  - isoimmune hemolytic disease,
  - G6PD deficiency, or other hemolytic conditions
  - sepsis
  - any significant clinical instability in the previous 24 hours

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- New evidence that bilirubin neurotoxicity does not occur until concentrations well above the 2004 exchange transfusion thresholds justified narrowly raising the PTT
- With the increased PTTs, appropriately following the current guidelines, including bilirubin screening during the birth hospitalization and timely post-discharge follow-up is important.
- The **use of sunlight** as a reliable therapeutic tool to decrease the TSB is **NOT recommended**.

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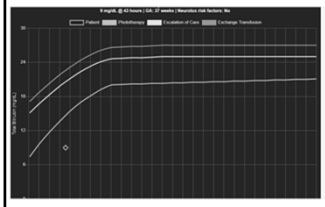
bilitool.org



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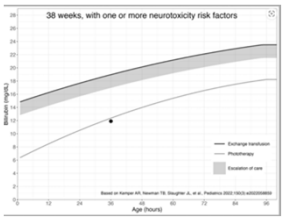
(2022) Hyperbilirubinemia management guidelines (peditools.org)



GA at birth	38 completed weeks	
Postnatal age	36 hours	
Bilirubin	12 mg/dL	
	Phototherapy threshold	Exchange threshold
* neurotoxicity risk factors	12.4 mg/dL	19 mg/dL
Confirmatory TSB	Measure TSB if TcB is ≥ 15 mg/dL or within 3 mg/dL of the phototherapy threshold	
Phototherapy	0.4 mg/dL below phototherapy threshold	
Escalation of care	5 mg/dL below escalation threshold	
Exchange transfusion	7 mg/dL below exchange threshold	
Recommendations	**Below phototherapy threshold** Birth hospitalization discharge follow-up recommendations for infants who have **NOT received phototherapy** For bilirubin 12 mg/dL at 36 hours age (0.4 mg/dL below the phototherapy initiation threshold): Measure TSB in 4 to 24 hours. Options: • Delay discharge and consider phototherapy • Discharge with home phototherapy if all considerations in the guideline are met • Discharge without phototherapy but with close follow-up	

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KAS 10

- **Intensive phototherapy is recommended at the TSB thresholds on the basis of gestational age, hyperbilirubinemia neurotoxicity risk factors, and age of the infant in hours.**
  - The PTT take both gestational age and the presence of other neurotoxicity risk factors into account.

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KAS 11

- For newborns who have already been discharged and then develop a TSB above the PTT, treatment with a home LED-based PT device rather than readmission to the hospital is an option for newborns who meet the following criteria.
  - Gestational age ≥38 weeks
  - ≥ 48 hours old
  - Clinically well with adequate feeding
  - No known hyperbilirubinemia neurotoxicity risk factors
  - No previous PT
  - TSB concentration no more than 1 mg/dL above the PTT
  - An LED-based PT device will be available in the home without delay
  - TSB can be measured daily

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Home phototherapy

- Less costly and disruptive to family routines and breastfeeding
- May help improve bonding and reduce stress compared with readmission for PT.
- Effectiveness depends on the quality of the home PT device as well as the ability of the family to appropriately use it.
- **NOT recommended** for newborns with hyperbilirubinemia **neurotoxicity risk factor**.

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Home phototherapy

- Feeding should be maintained during inpatient or home PT to promote bilirubin clearance and avoid dehydration.
- Interrupting phototherapy for breastfeeding does not impact the overall effectiveness of PT.
- Supplementation using the mother's expressed breastmilk may have similar benefits to infant formula supplementation without the potential concerns associated with formula.
- Use of **IVF** is **not recommended** unless there is evidence of dehydration that cannot be corrected enterally or if the TSB exceeds the escalation of care threshold.

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Monitoring Infants Receiving Phototherapy

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KAS 12

- For hospitalized infants, TSB should be measured within 12 hours after starting phototherapy. The timing of the initial TSB measure after starting PT and the frequency of TSB monitoring during PT should be guided by the age of the child, the presence of hyperbilirubinemia neurotoxicity risk factors, the TSB concentration, and the TSB trajectory.
  - TcB measurements on skin exposed to phototherapy tend to underestimate TSB concentrations.
  - Studies of TcB measurements on skin that has been covered by opaque patches during phototherapy have yielded mixed results regarding accuracy..

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KAS 13

- For infants receiving home PT, the TSB should be measured daily.
- Infants should be admitted for inpatient PT if the TSB increases and the difference between the TSB and the PT threshold narrows or the TSB is ≥1 mg/dL above the PTT

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KAS 14

- For newborns requiring PT, measure the H/H or CBC to assess for the presence of anemia and to provide a baseline in case subsequent anemia develops. Evaluate the underlying cause or causes of hyperbilirubinemia in infants who require PT by obtaining a DAT in infants whose mother had a positive antibody screen or whose mother is blood group O regardless of Rh(D) status or whose mother is Rh(D)−.
- G6PD activity should be measured in any infant with jaundice of unknown cause whose TSB increases despite intensive phototherapy, whose TSB increases suddenly or increases after an initial decline, or who requires escalation of care.
    - Newborns <24 hours old with a TSB concentration above the PTT likely has hemolytic disease.
    - Measurement of ETCOc, if available (helps to ID hemolysis)
    - Identifying whether there is G6PD deficiency or hereditary spherocytosis or other red cell membrane defects

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Discontinuing Phototherapy

- Rebound hyperbilirubinemia is defined as a TSB concentration that reaches the PTT for the newborn's age within 72 to 96 hours of discontinuing PT.
- Newborns who receive PT during their birth hospitalization are much more likely to experience rebound hyperbilirubinemia than those whose first treatment with PT occurs on readmission.

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Risk Factors for Rebound Hyperbilirubinemia

- Younger postnatal age (ie, <48 hr of life) at the start of PT
- Hemolytic disease
- Gestational age <38 weeks
- Higher TSB at the time of PT discontinuation in relationship to the PTT

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KAS 15

- Discontinuing PT is an option when the TSB has decreased by at least 2 mg/dL **below the hour-specific threshold at the initiation of phototherapy.**
- A longer period of phototherapy is an option if there are risk factors for rebound hyperbilirubinemia (eg, gestational age <38 weeks, age <48 hours at the start of phototherapy, hemolytic disease)

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Follow-up After Phototherapy

- The timing of follow-up bilirubin testing after discontinuing PT should be based on the risk of rebound hyperbilirubinemia.
- See specific circumstances in KAS 16
- All others should wait at least 12 hours, and preferably 24 hours to allow sufficient time for the bilirubin concentration to demonstrate whether there is rebound hyperbilirubinemia.
- Rebound hyperbilirubinemia should be treated according to the previous recommendations regarding the initiation of phototherapy

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KAS 16

- **Repeat bilirubin measurement after PT** is based on the risk of rebound hyperbilirubinemia.
  - Newborns who **exceeded PTT during the birth hospitalization and** (1) **received phototherapy before 48 hours** of age; (2) **had a positive DAT; or** (3) had **known or suspected hemolytic disease**, should have **TSB measured 6 to 12 hours after PT discontinuation and** a repeat bilirubin measured **on the day after PT discontinuation.**
  - All other newborns who **exceeded the PTT during the birth hospitalization** should have bilirubin **measured the day after phototherapy discontinuation.**
  - Newborns who **received PT during the birth hospitalization and** who were later **readmitted for exceeding the PTT** should have **bilirubin measured the day after phototherapy discontinuation**.
  - Newborns **readmitted because they exceeded PTT** following discharge but who **did not receive phototherapy during the birth hospitalization** and newborns treated with home phototherapy who exceeded the phototherapy threshold should have **bilirubin measured 1 to 2 days after phototherapy discontinuation or clinical follow-up 1 to 2 days after PT** to determine whether to obtain a bilirubin measurement.
  - It is an **option** to measure TcB instead of TSB if it has been at least 24 hours since PT was stopped.

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Escalation of Care and Providing an Exchange Transfusion

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Escalation of care

- The intensive care that some newborns with elevated or rapidly increasing bilirubin concentrations need to prevent the need for an exchange transfusion and possibly prevent kernicterus.
- This escalation of care requires management in the NICU and the newborn should be transferred to the NICU or a facility who will be able to provide this higher level of care.

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KAS 17

- Care should be escalated when an infant's TSB reaches or exceeds the escalation-of-care threshold, defined as 2 mg/dL below the exchange transfusion threshold.
- KAS 17 – 23 refer to the newborn requiring escalation of care (see the AAP guidelines for guidance to provide escalation of care).

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KAS 24

- Beginning at least 12 hours after birth, if discharge is being considered, the difference between the bilirubin concentration measured closest to discharge and the PTT at the time of the bilirubin measurement should be calculated and used to guide follow-up.
  - For infants at least 12 hours after birth and for infants who have not received PT before discharge.

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Timing of Follow-Up After Discharge

- Recommendation to **use the difference between the bilirubin concentration and the PTT** at the time of measurement to determine the interval between discharge and follow-up.
- This approach incorporates both **gestational age** and other hyperbilirubinemia **neurotoxicity risk factors** into the decision-making process.

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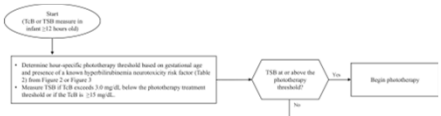

Phototherapy threshold minus TcB or TSB		Discharge Recommendations
0.1-1.9 mg/dL	Age <24 hours	Delay discharge, consider phototherapy, measure TSB in 4 to 8 hours
	Age≥24 hours	Measure TSB in 4 to 24 hours[a] Options: • Delay discharge and consider phototherapy • Discharge with home phototherapy if all considerations in the guideline are met • Discharge without phototherapy but with close follow-up
2.0-3.4 mg/dL	Regardless of age or discharge time	TSB or TcB in 4 to 24 hours[a]
3.5-5.4 mg/dL	Regardless of age or discharge time	TSB or TcB in 1-2 days
5.5-6.9 mg/dL	Discharging <72 hours	Follow-up within 2 days; TcB or TSB according to clinical judgment[b]
	Discharging ≥72 hours	Clinical judgment[b]
≥7.0 mg/dL	Discharging <72 hours	Follow-up within 3 days; TcB or TSB according to clinical judgment[b]
	Discharging ≥72 hours	Clinical judgment[b]

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- Flow diagram for infants during the birth hospitalization to determine post-discharge follow-up for **newborns who have not received phototherapy.**
- These follow-up guidelines are **based only on the management of hyperbilirubinemia.**
- **Other considerations that may influence the timing of follow-up** include gestational age, postnatal age, assessment of breastfeeding, weight loss from birth weight, and assessment of the well-being of the infant and parents.

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Hospital Policies and Procedures

- Hospitals/birthing centers should have clearly established policies and procedures to help all infants receive optimal care to prevent kernicterus.
- Clinicians should document activities specifically related to this clinical practice guideline in the medical record.
- Nursing protocols/standing orders should be established for the assessment of neonatal jaundice and when nursing staff can obtain a TcB or TSB. Nurses should be encouraged to obtaining a TcB or TSB if jaundice is noted within the first 24 hours after birth.
- All facilities treating infants should have the necessary equipment to provide intensive phototherapy.
- A family-centered approach to PT should allow for PT in the mother's room to allow for bonding and support breastfeeding.

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Hospital Policies and Procedures

- All facilities treating infants without the equipment or personnel to escalate care should have written plans for rapid and safe transfer of infants who might require exchange transfusion.
- These plans should include the ability to provide phototherapy during transfer.
- Facilities should have a mechanism for infants to have a follow-up TcB or TSB measured that includes weekends and holidays.
  - A system should be in place to provide care whenever there is uncertainty regarding the provision of appropriate follow-up.
  - This care includes a mechanism for providing the results of any testing to families and providing care according to these guidelines.

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KAS 25

- Before discharge, all families should receive written and verbal education about neonatal jaundice. Parents should be provided written information to facilitate post-discharge care, including the date, time, and place of the follow-up appointment and, when necessary, a prescription and appointment for a follow-up TcB or TSB.
- Birth hospitalization information, including the last TcB or TSB and the age at which it was measured, and DAT results (if any) should be transmitted to the primary care provider who will see the newborn at follow-up. If there is uncertainty about who will provide the follow-up care, this information should also be provided to families.

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Jaundice Education

- An explanation of jaundice - the need to monitor newborns for jaundice, dehydration, and lethargy
- Signs of ineffective feeding, fussiness, and illness
- Ensure that parents understand these issues and the need for follow-up.
- The AAP has a parent handout addressing these issues.
  - Jaundice in Newborns: Parent FAQs - HealthyChildren.org
  - Jaundice and Your Newborn | Pediatric Patient Education | American Academy of Pediatrics (aap.org)

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Take Home Points

- Kernicterus is rare but unfortunately it still exists. It can be devastating for families.
- Implementation of systems to provide consistent application of these recommendations for all newborns ≥ 35 weeks' gestation within mother-baby units, hospitals, and PC clinics is critical to the success of these recommendations.
- This clinical practice guideline provides indications and approaches for phototherapy and escalation of care and when treatment and monitoring can be safely discontinued.
- When appropriate, engage in shared decision making with families.

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