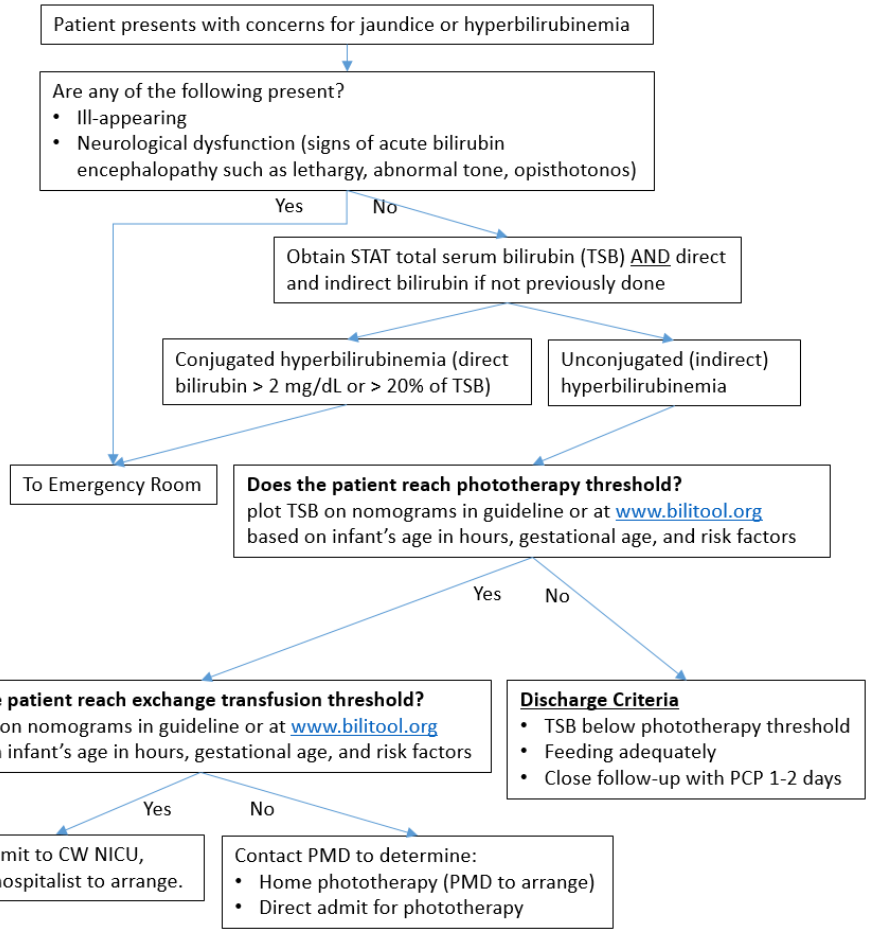
Children's Hospital and Health System, Inc.
Patient Care Evidence Based Guideline
CW Urgent Care (UC)

SUBJECT: Treatment of Neonatal Jaundice in Urgent Care

Inclusion criteria
- Born ≥ 35 weeks gestation
- Age ≥ 24 hours and ≤ 14 days
- Unconjugated (indirect) hyperbilirubinemia

Exclusion criteria
- Born < 35 weeks gestation
- Age < 24 hours and > 14 days
- Conjugated hyperbilirubinemia (direct bilirubin > 2 mg/dL or > 20% of TSB)
- Neurological dysfunction (signs of acute bilirubin encephalopathy such as lethargy, abnormal tone, opisthotonos)
- Suspected sepsis or ill-appearing



Purpose: To evaluate and initiate treatment of neonatal jaundice in neonates with documented or history of elevated **unconjugated (indirect)** bilirubin or jaundice.

Inclusion criteria: Infants who are **≥ 24 hour**s and **≤ 14 days** old who were born at **≥ 35 weeks** gestation.

Exclusion criteria: Premature babies < 35 weeks gestation and babies presenting with jaundice after 2 weeks of age.

- These infants may have another etiology for their hyperbilirubinemia that likely would not respond to phototherapy so would fall out of the recommendations of this guideline.
- Infants with previous lab results showing conjugated hyperbilirubinemia (direct bilirubin > 2 mg/dL or > 20% of TSB) would fall outside of this guideline.

Definition: Jaundice refers to the yellow coloration of the skin and the sclera caused by the accumulation of bilirubin in the skin and mucous membranes. Jaundice is caused by a raised level of bilirubin in the body, a condition known as hyperbilirubinemia. Approximately 80% of all infants will have some amount of jaundice. Monitoring bilirubin levels is important to avoid elevated levels that cause bilirubin associated encephalopathy and kernicterus. *Total serum bilirubin (TSB) generally peaks at 3-5 days of life.*

Exclusively breastfed infants regularly have jaundice of two types.

- Breast**feeding** jaundice occurs from suboptimal intake of feeds, usually peaks at 3-5 days of life, and is often associated with excessive weight loss. Increased enterohepatic circulation of bilirubin with low caloric intake and decrease stool frequency is the pathophysiology of this type of jaundice.
- Breast **milk** jaundice is typically not pathologic. It involves only elevated unconjugated bilirubin and can last up to 3 months.

Jaundice has many possible causes including blood group incompatibility, hemolytic disease, sepsis, metabolic and endocrine disorders, and anatomic abnormalities of the liver. If left untreated, hyperbilirubinemia can lead to acute bilirubin encephalopathy and kernicterus. Kernicterus describes the chronic and permanent clinical sequelae of bilirubin toxicity including cerebral palsy, high frequency hearing loss, dental dysplasia and mild mental retardation. A total bilirubin > 25 mg/dL is associated with an increased risk of these problems.

Hyperbilirubinemia Neurotoxicity Risk Factors from 2022 AAP Guideline

- Gestational age < 38 weeks and this risk increases with the degree of prematurity
- Albumin < 3.0 g/dL
- Isoimmune hemolytic disease (positive DAT), G6PD deficiency, or other hemolytic conditions
- Sepsis
- Significant clinical instability in the previous 24 hours

Etiology: Bilirubin is mainly produced from the breakdown of red blood cells. Red blood cell breakdown produces **unconjugated (indirect)** bilirubin, which circulates mostly bound to albumin. When it is not bound to albumin it is free and thus able to enter the brain. Unconjugated bilirubin is metabolized in the liver to produce **conjugated (direct)** bilirubin which then passes into the gut and is largely excreted in stool. Unconjugated bilirubin is toxic to neural tissue at a high level.

Differential Diagnosis:

- Pathologic Jaundice, defined as:
  - Present in first 24 hours of life
  - Total Serum bilirubin (TSB) level > age-specific 95th percentile
  - TSB rising by > 0.2 mg/dL per hour
  - Conjugated bilirubin > 2 mg/dL or > 20% of TSB
- Infections including TORCH infections and/or sepsis
  - Consider UTI with elevated conjugated bilirubin and/or late onset (after the fourth or fifth day) of jaundice
- Hemolysis such as ABO or Rh incompatibility
  - G6PD which occurs in 11-13% of African Americans
- Normal skin pigmentation variant
- Birth trauma
- Anatomic or metabolic liver abnormalities
- Metabolic and endocrine disorders (including maternal diabetes)
- Polycythemia

Guideline

Subjective Data/History

- Birth History
  - Gestational age
  - Date and time of birth
  - Birth weight
  - Delivery details (forceps, vacuum, etc.)
  - Maternal blood type
  - Maternal or infant infections
- HPI
  - Feeding: breast/formula, duration & frequency of feed, intake in past 24 hours (minimum of 8 feedings in 24 hours is needed)
  - Urine output in past 24 hours
  - Pattern of stooling; color of stool
  - Presence of fever, method of temperature measurement, acetaminophen use
  - Signs of bilirubin encephalopathy:

        - Early: lethargy, hypotonia, high-pitched cry, poor feeding
        - Intermediate: irritability, retrocollis (spasmodic torticollis), opisthotonos (muscle spasms causing backward arching of head, neck and spine), fever
        - Advanced: apnea, stupor, coma
- Family History
    - Sibling received phototherapy
    - Hematological disorders (i.e. G6PD-deficiency, hereditary spherocytosis, known blood group incompatibility)
    - Inherited conditions leading to decreased hepatic bilirubin clearance such as Crigler-Najjar syndrome and Gilbert syndrome

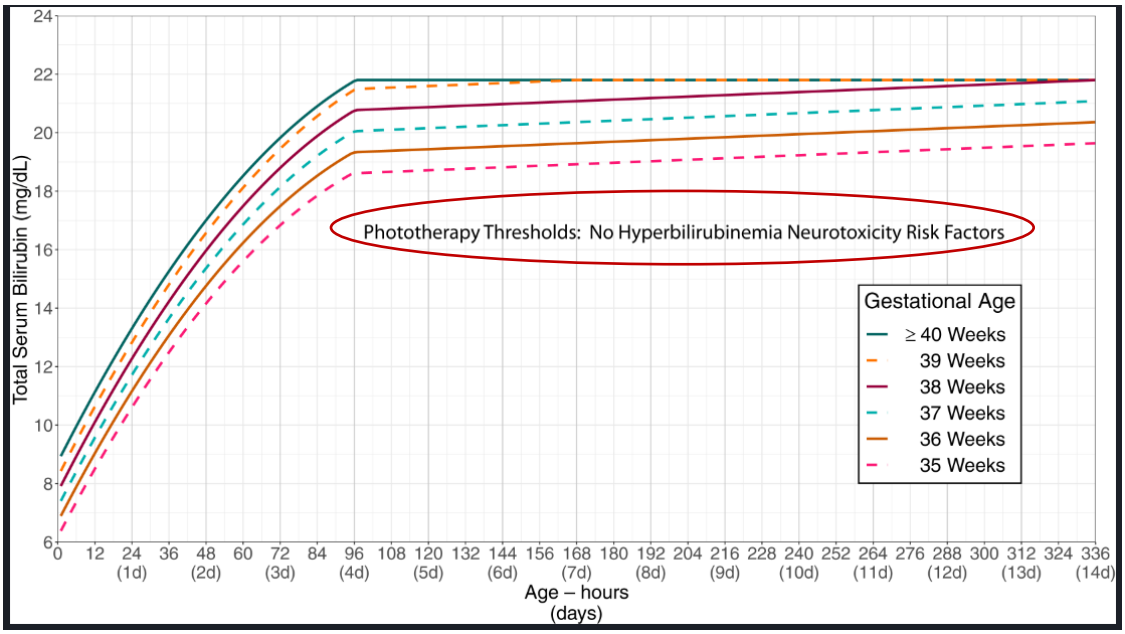
Objective Data/Physical Exam

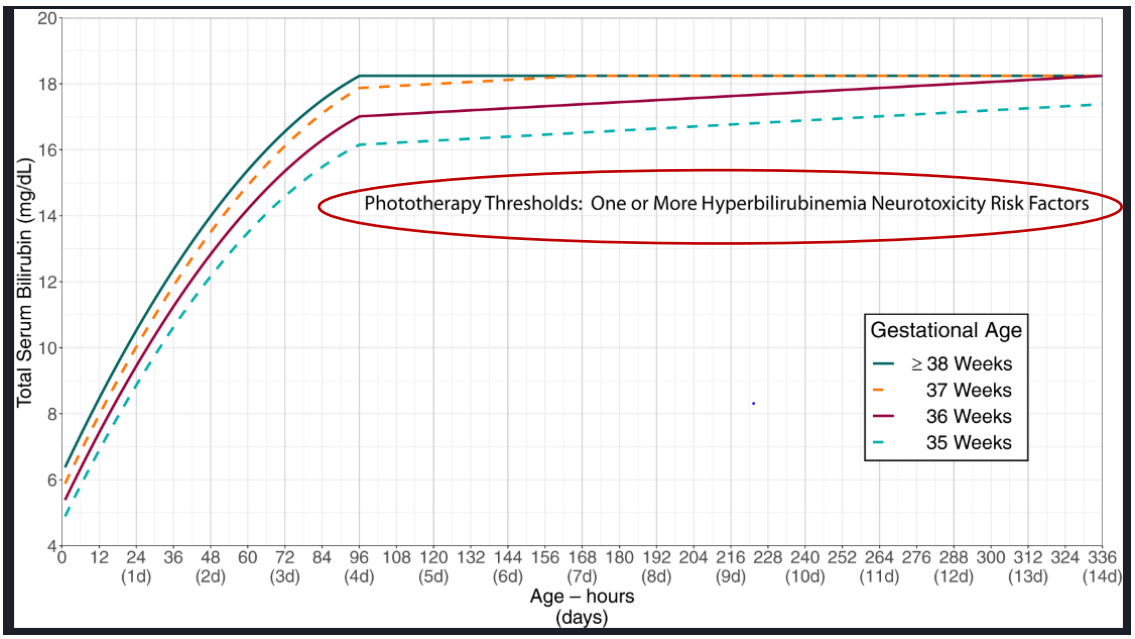
- Vital signs, weight
    - For febrile infants (history of or current rectal temperature ≥ 38°C or 100.4°F), follow the Urgent Care Febrile Neonate evidence-based guideline
- General appearance
- Hydration status
- Abdominal exam: hepatomegaly, splenomegaly
- Neurologic exam: tone, retrocollis, opisthotonus, nuchal rigidity
- Skin exam: bruising, petechiae, pallor, hematoma, rash
- Assess for jaundice (*visual estimation of bilirubin levels from the degree of jaundice can lead to errors)*
    - Cephalocaudal progression
        - Infants whose jaundice is limited to the face have a lower bilirubin level than those with jaundice below the nipple line
    - Scleral icterus
    - Apply gentle pressure with 1 finger to reveal color of skin and subcutaneous tissue

Diagnostic Studies & Treatment

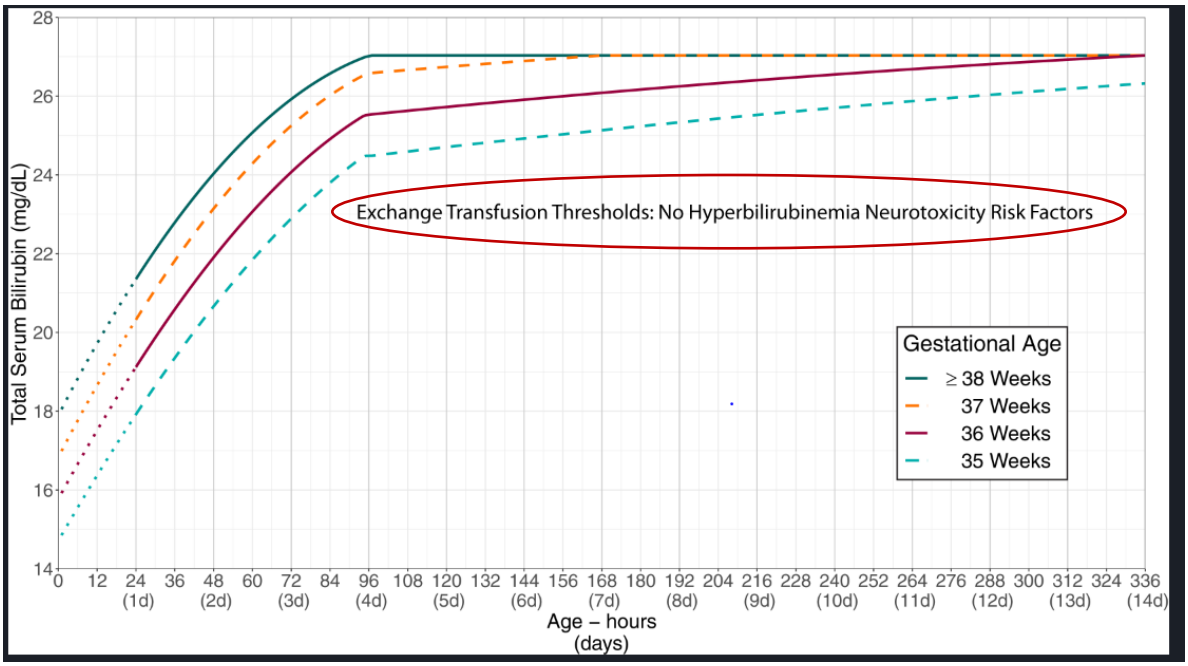
- Ill-appearing infants with concerns of hemolysis, infection, acute bilirubin encephalopathy etc. should be evaluated in the ER
- See Algorithm at start of document and nomograms below
- Use www.bilitool.org to access an hour specific nomogram to determine your patient's risk stratification
    - All bilirubin levels should be interpreted based on infant's age in hours
    - Laboratory values: use total serum bilirubin (TSB) from a clinical laboratory
    - Must have the patient's date and time of birth and the TSB
    - Consider trend of bilirubin

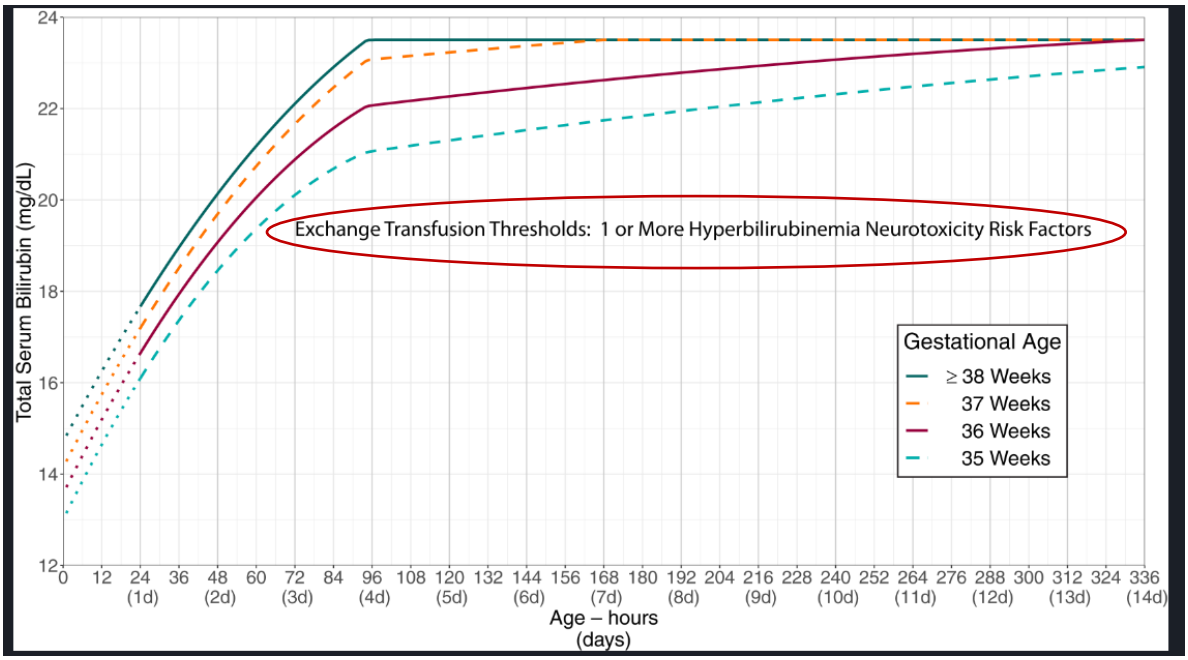
Phototherapy Nomograms (also available at www.bilitool.org)





Exchange Transfusion Nomograms (also available at www.bilitool.org)





Education of Patient/Family

- Adequate oral intake/hydration
  - Encourage frequent feedings
  - Breastfeeding should continue during this time
    - Breast fed infants should be fed a minimum of 8-10 times/24 hours
    - Consider supplementation if infant has continued weight loss (> 10% of birth weight), poor stooling, or difficulty with breast feeding
    - Supplement with expressed breast milk or, if not available, formula
    - Early consultation with lactation consultant if needed
    - Encourage frequent skin to skin contact between mother and baby
    - Infant should be put to breast before onset of crying
    - Ensure mother is hand expressing/pumping breast milk frequently to help establish milk supply
    - Bottle fed infants should have at least 1-2 ounces of expressed breast milk or formula every 2-3 hours for the first week of life
- Recognize signs of increasing jaundice and dehydration

Follow-up

- Call PMD or refer to ER if the infant develops fever, lethargy, hypotonia, irritability, arching, poor feeding, signs of infection, signs of dehydration, or other concerns/questions.

Amy Romashko, MD
Medical Director, CW Urgent Care

References

Altuntas, N. (2020). Is there any effect of hyperbilirubinemia on breastfeeding? If any, at which level? *Breastfeeding Medicine, 15*(1), 29-34.

American Academy of Pediatrics. (2022). Clinical Practice Guideline Revision: Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation. *Pediatrics, 150(3),* e2022058859 https://doi.org/10.1542/peds.2022-058859

Aronson, D., Lavelle, J., Jacobstein, C., & Boorstein, N. (2018). CHOP ED pathway for evaluation/treatment of neonates with hyperbilirubinemia/jaundice. Retrieved from http://www.chop.edu/clinical-pathway/hyperbilirubinemiajaundice-clinical-pathway-neonates

Gartner, L. (2010). ABM clinical protocol #22: Guidelines for management of jaundice in the breastfeeding infant equal to or greater than 35 weeks' gestation. *Breastfeeding Medicine, 5*(2), 87-93.

Lauer, B., & Spector, N. D. (2011). Hyperbilirubinemia in the newborn. *Pediatrics in Review, 32*(8), 341-348.

Maisels, M. J., Bhutani, V. K., Bogen, D., Newman, T. B., Stark, A. R., & Watchko, J. F. (2009). Hyperbilirubinemia in the newborn infant ≥ 35 weeks' gestation: An update with clarifications. *Pediatrics, 124*(4), 1193-1198.

Sardari, S., Mohammadizadeh, M., & Namnabati, M. (2019). Efficacy of home phototherapy in neonatal jaundice. *Journal of Comprehensive Pediatrics, 10*(1), 1-6.

Treatment information also provided by Yan Zhan, Pediatric Emergency Medicine Fellow, Children's Wisconsin (personal communication, May 2020).

Treatment information also provided by Sarah Thill, Assistant Professor, Pediatric Emergency Medicine, Children's Wisconsin (personal communication, October 2023).