Subject: Hyperbilirubinemia in the Newborn Infant	
REVISION DATE: Mar 2016, June 2012, April 2007 REPLACES: NSY: Hyperbilirubinemia	WRITTEN: June 1982 SUPERSEDES DATE: June 2012

This guideline is used to assist staff when providing care to infants presenting with hyperbilirubinemia. This applies to all medical and nursing personnel.

Purpose: The goal of this guideline is to provide a framework for the prevention and management of hyperbilirubinemia in newborn infants and to promote supportive care and protection during phototherapy.

Summary of Changes: References/content updated to reflect most current standards of practice.

1. References:

1.1. American Academy of Pediatrics (AAP) (2004). Management of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation. *Pediatrics 114*(1), 297-316.

1.2. Lippincott, Williams, & Wilkins (2013). Phototherapy. Retrieved from http://procedures.lww.com/lnp/view.do?pId=951539&s=p&fromSearch=true&searchQuery=phototherapy.

1.3. Lippincott, Williams, & Wilkins (2012). Fiber-optic phototherapy pads and blankets use, neonate. Retrieved from http://procedures.lww.com/lnp/view.do?searchQuery=fiber-optic&pId=951196.

1.4. Ohmeda. *BiliBlanket phototherapy light operation, maintenance, and service manual*. Retrieved from http://www.cookchildrens.org/SiteCollectionDocuments/HomeHealth/Education/HomePhototherapy/CCHH_Phototherapy_Ohmeda-Bili-Blanket-Op-Manual.pdf.

1.5. Natus. *NeoBLUE cozy Operating Instructions.* Retrieved from http://www.natus.com/documents/neobluecozy_inservice_guide.pdf.

1.6. Natus. *NeoBLUE LED Phototherapy Hospital Inservice*. Retrieved from http://www.natus.com/documents/051693E.pdf.

2. Responsibilities:

2.1. Credentialed delivering provider.

2.1.1. Manage and assume responsibility for patient care administered.

2.1.2. Place appropriate medical orders in patient's Electronic Health Record (EHR) based on comprehensive patient assessment.

2.2. Nurse:

2.2.1. Provide recognized nursing standard of care to patients in coordination with provider's orders.

2.2.2. Acknowledge and carry-out all provider orders in the EHR.

2.2.3. Report all assessment findings out of expected range to provider.

3. General

3.1. More than 60% of infants will develop jaundice with 25% at risk for severe hyperbilirubinemia (Lippincott, 2012).

3.2. In effort to reduce hyperbilirubinemia, The American Academy of Pediatrics (2004) recommends:

3.2.1. Breastfeeding 8-12 times/day for the first several days, as frequent nursing decreases the incidence of significant hyperbilirubinemia in breastfed infants.

3.2.2. Ongoing, systematic assessment of the infant for signs and risks of hyperbilirubinemia.

3.2.2.1. Jaundice should be assessed no less than every 8-12 hours. All pregnant women should have blood type and Rh factor screening. If the mother is Rh-negative, a direct Coombs, and a blood type and Rh on the infant's cord blood are necessary.

3.2.3. A total serum bilirubin (TSB) or transcutaneous bilirubin (TcB) level should be measured within the first 24 hours of life.

3.2.4. Treatment with phototherapy, or exchange transfusion when indicated, based on infant's age in hours and TSB level. (Note: exchange transfusion requires transfer to NICU.)

3.2.4.1. Immediate exchange transfusion is recommended in any infant who is jaundiced and presents with signs of acute bilirubin encephalopathy, including: hypertonia, arching, retrocollis, opisthotonos, fever, and high-pitched cry, or if TSB rises despite intensive phototherapy.

3.2.4.2. I**f the TSB is 25mg/dL or higher at any time, it is a medical emergency.**

3.2.5. A systematic assessment for hyperbilirubinemia, written and verbal education about newborn jaundice, and a timeline for follow-up appointments within the first few days should be completed before discharge.

4. Hyperbilirubinemia Risk Factors (AAP, 2004)

4.1. Major Risk Factors

- Jaundice observed in the first 24 hours
- Blood group incompatibility with positive direct Coombs test, and/or other known hemolytic disease
- Gestational age 36-36.6 weeks
- Previous sibling received phototherapy
- Cephalohematoma or significant bruising
- Exclusive breastfeeding and excessive weight loss (> 7% bodyweight)
- East Asian race

4.2. Minor Risk Factors

- Gestational age 37-38 weeks
- Jaundice observed before discharge
- Previous sibling with jaundice
- Macrosomic infant of a diabetic mother
- Maternal age ≥ 25
- Male gender

5. Contraindications and Complications to Phototherapy

5.1. Contraindicated in infants with congenital porphyria and those receiving photosensitizing drugs (Lippincott, 2012).

5.2. Complications include dehydration, hypothermia, hyperthermia, diarrhea, and bronze baby syndrome (a darkening of the skin, serum and urine) (Lippincott, 2013).

6. **Definitions**

6.1 Total Serum Bilirubin (TSB) – Measures the circulating level of bilirubin in the infant's blood. TSB is expected to increase with age (hours since birth), (see Attachment 2 for expected TSB range-to-age correlation)

6.2. Transcutaneous Bilirubin (TcB) – Test sends a quick flash of light through the skin to measure bilirubin levels. Used as a screening tool to determine if TSB is needed (may not act as a substitute for TSB).

6.3. Hyperbilirubinemia - TSB level above 5mg/dL in full term infants in the first day of life or 15-22mg/dL after the first 24 hours depending on the neonate's age, risk factors, and clinical assessment findings (Lippincott, 2012).

6.4. Phototherapy – Exposing a neonate to high-intensity light that breaks down bilirubin for transport to the GI system and excretion. The efficacy of phototherapy is influenced by the energy output of the phototherapy light, the spectrum of the light, and the amount of surface area of the infant exposed to the light source.

7. Standards of Practice/Guidelines for Care:

7.1. Monitor the infant for **signs of jaundice** including lethargy, poor feeding, and yellowing of the skin, and document in patient's EHR at least every 8-12 hours.

> 7.1.1. Assess for jaundice by blanching the skin using digital pressure to reveal the underlying color. Assessment must be performed in a well-lit room or by a window. Jaundice is usually seen first in the face and progresses to the trunk and extremities.

7.2. Obtain TcB at 24 hours of life, or earlier if infant is presenting with signs of jaundice.

> 7.2.1. **Follow Hyperbilirubinemia Guidelines for Neonates ≥ 35 Weeks** flowchart (Attachment 1). All bilirubin levels should be interpreted according to the infant's age in hours. (AAP, 2004).

7.3. Initiate and discontinue phototherapy per provider's order. Order should specify what type of phototherapy to initiate and intensity level (e.g. spotlight, bili blanket, and intensive or low-intensity).

7.4. If phototherapy is initiated, the provider may order "bilirubin work-up" including mother's blood type and Rh factor, infant's blood type, and direct Coombs (if not already obtained).

> 7.4.1. Draw labs as ordered per provider.

7.5. Prepare the Equipment

- Infant bili mask
- Tape Measure
- Thermometer
- Spectrometer
- Isolette or open crib depending on provider's order and phototherapy source used.

Depending on provider's order:

- Ohmeda BiliBlanket Plus Phototherapy System and disposable cover
- Olympic Bili-Lite
- NeoBLUE LED Phototherapy
- NeoBLUE Cozy LED Phototherapy and disposable mattress cover

7.6. Pre-warm the isolette before placing infant in it and set to manual mode.

7.7. Explain the procedure to the infant's caregivers to reduce anxiety and ensure cooperation.

7.8. Obtain baseline vital signs on the infant.

7.9. Place eye covers over the infant's eyes to protect from corneal injury. Ensure eyes are closed and covers completely cover the eyes without excessive pressure and without occluding the nares.

7.10. Undress the infant to allow for maximal skin exposure. Keep a small diaper on to protect genitalia.

7.11. **BiliBlanket Plus Phototherapy System** (Ohmeda, Operation and Service Manual)

7.11.1. Insert the light pad into a new, disposable cover or vest and secure the cover or vest around the fiber optic cable with the self-adhesive tabs. The adhesive side of the tabs must be facing in the same direction as the pad's primary light side.

7.11.2. Switch on the on/standby switch. Using the brightness selector switch on the front panel, select each of the light intensity settings and ensure that light is emitted from the pad.

7.11.3. Cover the patient's eyes when using the biliblanket to shield them if there is concern of exposure to direct light from the light pad.

7.11.3.1. Eye protection is not necessary when using the vest or when pad can be maintained on the patient's back.

7.11.4. The infant, along with the light pad, may be covered or wrapped in a blanket. Infant will continue to receive effective phototherapy treatment as long as the disposable-covered, light emitting section of the pad remains in contact with the

skin. The disposable cover should be the only material between the light emitting side of the pad and the infant's skin.

7.11.5. If used with an incubator, the illuminator should be placed on a shelf or mounted using the mounting bracket near the treatment site. When using an incubator, the fiber optic cable should be inserted through the access port or portholes and the pad placed on the mattress with the light side up. The illuminator should NEVER be placed inside the infant compartment of the incubator, warmer, or bassinet)

7.12. **NeoBLUE Cozy LED Phototherapy** (natus, Operating Instructions)

7.12.1. Blue light device positioned underneath infant for intensive phototherapy

7.12.2. Plug power supply into the base of the cozy device.

7.12.3. Place device in an enclosed area (bassinet). **Do Not** use outside of an enclosed area as this creates a risk for the infant to roll off the device.

7.12.4. Ensure air vents are uncovered.

7.12.5. Place disposable mattress cover over mattress and place on system.

7.12.6. Place infant supine on mattress. Blankets may be placed for added warmth, ensure vents remain uncovered.

7.8.7. If surface area becomes too warm, device will automatically shut off.

7.8.8. NeoBLUE overhead lights may be used in conjunction with NeoBLUE cozy.

7**.13. NeoBLUE LED Phototherapy** (natus, Hospital In-Service)

7.13.1**.** Check light intensity using a neoBLUE Radiometer. Intensity is inversely related to the distance from the infant. Adjust distance from light to infant to reach desired intensity level based on the provider's order.

Distance	Intensity (µW/ cm²/nm)	
	High	Low
6 in (15cm)	54	24
12 in (30.5 cm)	35	15
18 in (45 cm)	20	9
24 in (60 cm)	12	5

7.13.2. Place infant in bassinet or isolette. Turn on power switch on front of light enclosure and press the "target illumination switch" and center the red light over the infant's torso.

7.13.3. Per provider's order, select high or low intensity on the irradiance level control switch.

7.13.4. Ensure that the vents are uncovered. NeoBLUE may be used with a bassinet or isolette.

7.14. Olympic Bili-Lite

7.14.1. Place the spectrometer in the middle of the sleep surface to measure the energy emitted by the lights. Measure energy before placing infant under the lights and then every 12 hours.

7.14.1.1. Low-intensity should measure at least 8 µW/ cm²/nm.
7.14.1.2. Intensive should measure at least 30 µW/ cm²/nm.

7.14.2 Measure distance from infant to light and adjust light height as necessary to reach physician's ordered intensity. Distance from the Olympic Bili-Lite should be approximately 18 inches.

7.15. Monitor TSB and/or TcB as ordered.

7.15.1. Turn off the lights for blood collection as light can break down the bilirubin in the sample leading to an inaccurate result.

7.15.2. Notify the provider if the bilirubin level nears 20 mg/dL in full term infants and 15 mg/dL in premature infants, or per provider's orders (Lippincott, 2013).

7.15.3. The bilirubin level often rises slightly after discontinuing phototherapy (rebound).

7.16. Assess infant's temperature 30 minutes after initiation of phototherapy, then every 2 hours. Temperature should be maintained at 97.7-99.5°F.

7.17. Assess spectroradiometer reading 30 minutes after initiation of treatment, then every two hours.

7.18. Change eye covers at least every 4 hours. Monitor for signs of conjunctivitis (drainage and swelling). Remove eye covers when neonate is not under the lights.

7.19. Closely monitor the infant's hydration status including daily weight and intake and output with each feeding.

7.19.1. Offer frequent feedings (approximately every 3 hrs.). Breastfeeding should be continued in infants who require phototherapy (AAP, 2004).

7.19.2. If the infant appears dehydrated, supplement with expressed breast milk or formula as appropriate. Per the AAP (2004), breastfeeding may be interrupted temporarily and formula substituted to help reduce bilirubin levels.

7.20. Assess activity and feeding behavior for signs of acute bilirubin encephalopathy including hypertonia, arching, retrocollis, opisthotonos, fever, and high-pitched cry.

7.21. Turn and reposition the infant every 3-4 hours and change diaper frequently to avoid skin breakdown.

7.21.1. Infant's urine may appear dark in color and stools may be watery and dark greenish in color as bilirubin elimination increases.

7.22. Encourage the parent(s) to participate in infant care responsibilities and to maintain physical contact with the infant whenever possible.

7.22.1. Phototherapy may be interrupted for up to 30 minutes for each feeding.

7.22.2. If the infant is only using a biliblanket, the infant with the biliblanket wrapped snugly around them can be held at any time.

7.22.3. If an infant is using a biliblanket and is also under phototherapy lights, the infant with the biliblanket wrapped snugly around them may be removed from under the phototherapy lights for up to 30 minutes for each feeding.

7.22.4. If the bilirubin level is reaching the exchange transfusion zone, administer phototherapy continuously (except during lab draws).

7.23. Provide caregivers with verbal and written educational materials regarding signs and symptoms of jaundice before discharge.

8. Recommended Documentation:

8.1. Assess infant for jaundice at least every 12 hours.

8.2. Assess TcB at 24 hours of life (or earlier if infant is presenting with signs of jaundice). TSB if indicated and subsequently per provider's orders.

8.3. Initiation of phototherapy including type of phototherapy used, distance of infant from light source, and infant's baseline vital signs.

8.4. Spectroradiometer readings prior to initiation of phototherapy, 30 minutes after, then every 2 hours.

8.5. Assess infant's temperature 30 minutes after initiation of phototherapy, then every 2 hours.

8.6. Assess infant's eyes every 4 hours and with any removal of eye patches.

8.7. Assess skin integrity, intake and output, infant's disposition, and document frequency of position changes at least every 12 hours.

8.8. All provider communication.

8.9. Any education performed and educational materials given.

9. Notify the provider immediately for the following:

9.1. TSB ≥ 12 mg/dL with no phototherapy initiated.

9.2. Infant showing signs and symptoms of acute bilirubin encephalopathy

9.3. TSB rises or nears 20 mg/dL in full term infants and 15 mg/dL in premature infant despite intensive phototherapy.

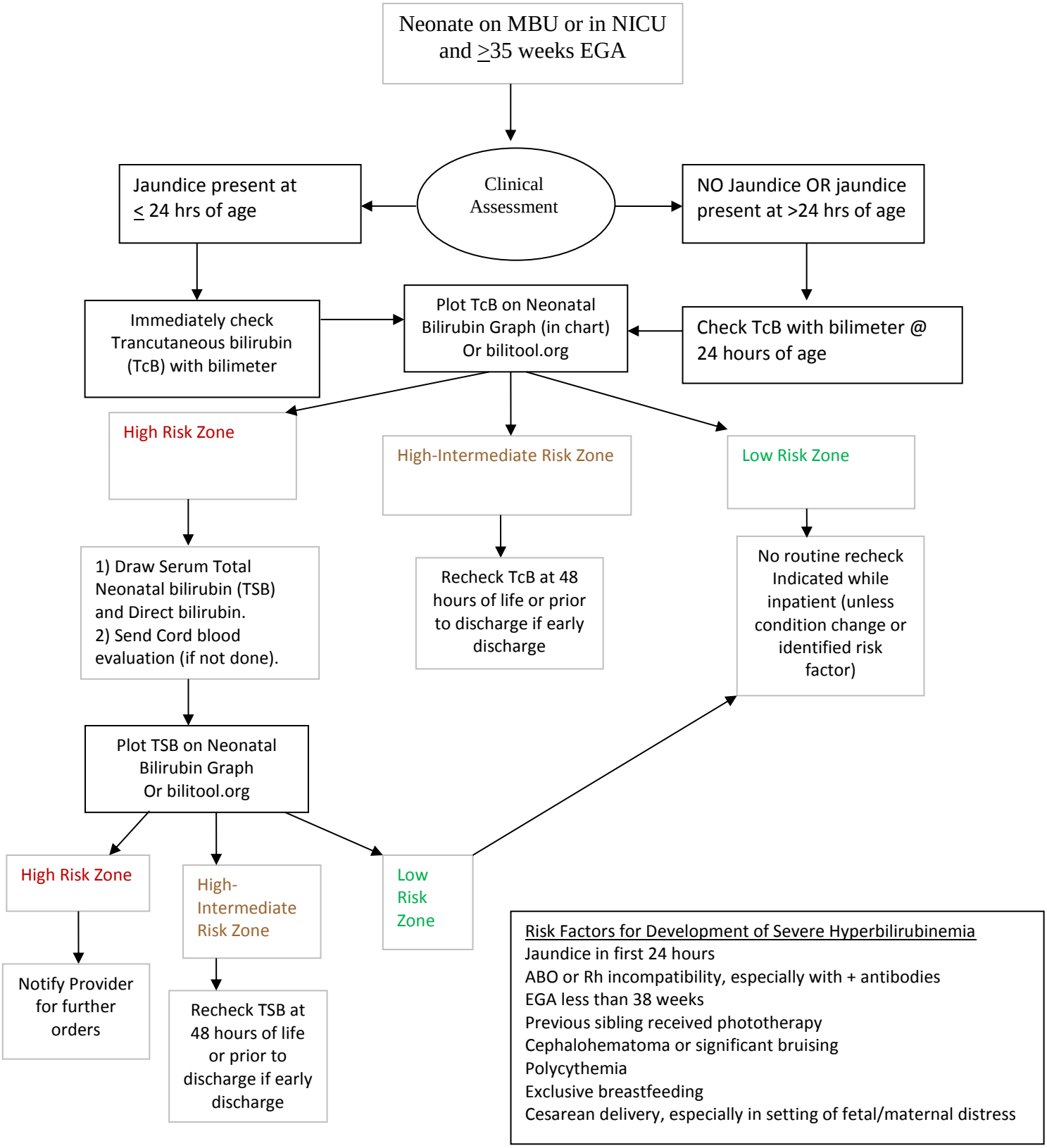
10. Attachments:

10.1. Attachment 1: Alaska Native Medical Center Hyperbilirubinemia Guidelines for Neonates ≥ 35 Weeks

10.2. Attachment 2: Alaska Native Medical Center Bilirubin Graphing Sheet for Neonates ≥ 35 weeks gestation (AAP, 2004)

Attachment 1

Alaska Native Medical Center
Hyperbilirubinemia Guidelines for Neonates > 35 weeks
Use to determine need for phototherapy



Attachment 2

Alaska Native Medical Center
Bilirubin Graphing Sheet for Neonates ≥ 35 weeks gestation (AAP, 2004)
Use to determine need for phototherapy