

**Inclusion criteria:** newborns already discharged from birth hospital or who remain in NICU AND are  $\leq 14$  days old, born at  $\geq 35$  wk gestation, previously suspected/known indirect hyperbilirubinemia with suspected/known need for phototherapy

**Exclusion Criteria:**  $>14$  days old;  $<35$  wk gestation at birth, suspected sepsis, signs of hyperbilirubinemia neurotoxicity (hypertonia, arching, retrocollis, opisthotonos, fever, high pitched cry)

## Phase of Care Navigation Links

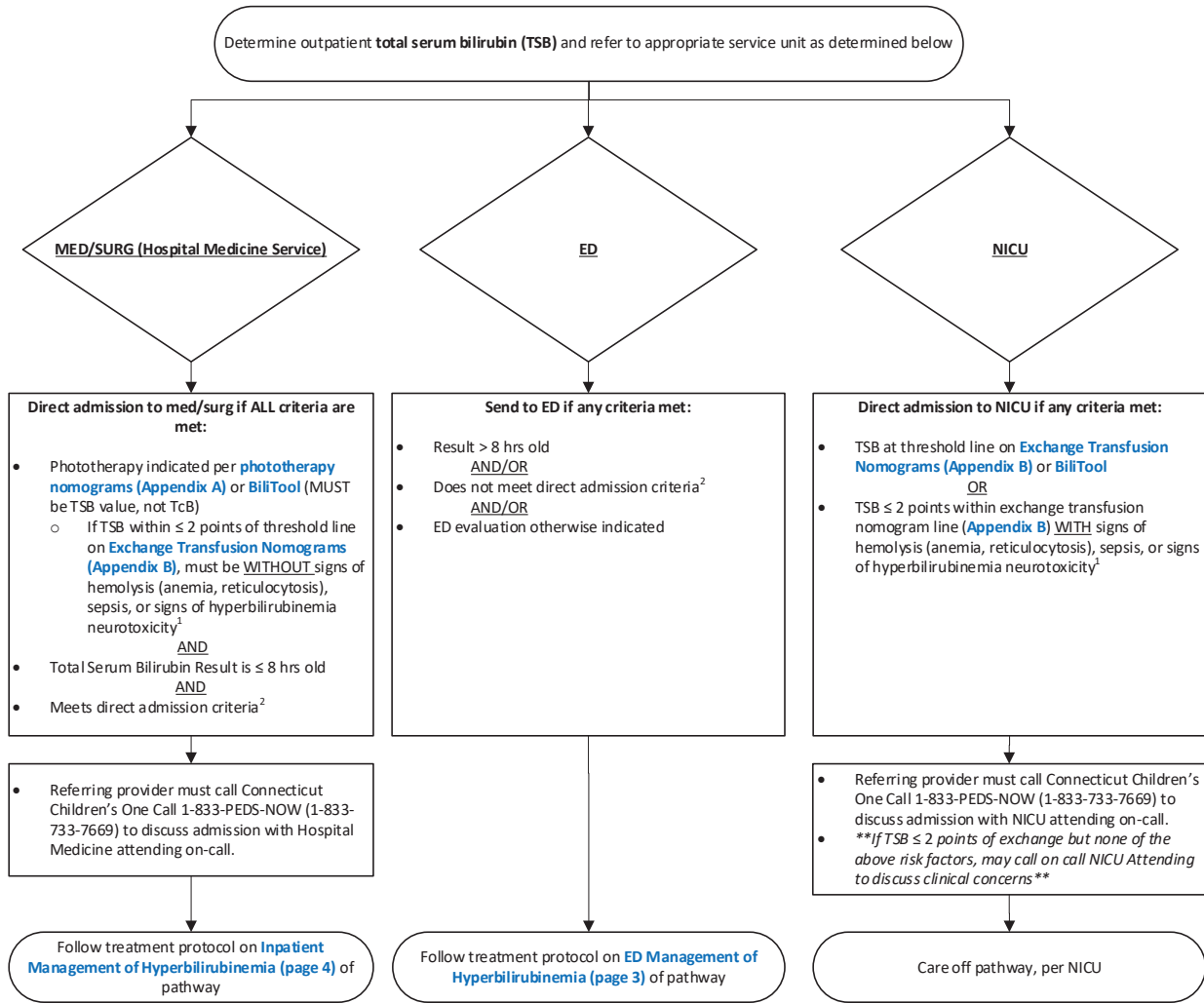
- [Admission Algorithm](#)
- [Emergency Department](#)
- [Inpatient Management](#)

## Appendices and Feeding Log

- [Appendix A: Phototherapy Nomograms](#)
- [Appendix B: Exchange Transfusion Nomograms](#)
- [Appendix C: Etiologies and Risk Factors](#)
- [Appendix D: Admitting RN Tips and Tricks](#)
- [Appendix E: Feeding Log](#)

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**<sup>1</sup>Signs of Hyperbilirubinemia Neurotoxicity**

- Hypertonia
- Arching
- Retrocollis
- Opisthotonos
- Fever
- High pitched cry

**<sup>2</sup>Direct admission criteria:**

- Patient has TSB within 8 hours of admission
- Patient seen in last 24 hours by referring service
- Patient has accepting attending
- Patient stable to be on med/surg unit without medical attention for 30 minutes



**Inclusion criteria:** newborns already discharged from birth hospital or who remain in NICU AND are ≤14 days old, born at ≥35 wk gestation, previously suspected/known indirect hyperbilirubinemia with suspected/known need for phototherapy  
**Exclusion Criteria:** >14 days old; <35 wk gestation at birth, suspected sepsis, signs of hyperbilirubinemia neurotoxicity<sup>1</sup>

Determine appropriate admission service (MS Floor vs NICU) based on outpatient bilirubin (Admission Algorithm):

- If patient sent to ED:**
- Triage RN: ESI level 2 (acute)
  - ED RN:
    - Obtain sample for total and direct serum bilirubin and POCT glucose via heel stick, regardless of need for additional labs or IV access (includes patients w/prior result < 8 hrs old)
    - Place infant on bili blanket STAT

- Signs of Hyperbilirubinemia Neurotoxicity**
- Hypertonia
  - Arching
  - Retrocollis
  - Opisthotonos
  - Fever
  - High pitched cry

**Initial Provider Assessment**

**Clinical history/physical exam:**

- Gestational Age
- Current age in hours
- Mother's blood type (Infant's blood type if mother type O, Rh negative, or antibody +)
- Birth weight and current weight
- Method and frequency of feeding
- Stool and urine output
- Signs/level of dehydration

**Hyperbilirubinemia Evaluation for Treatment:**

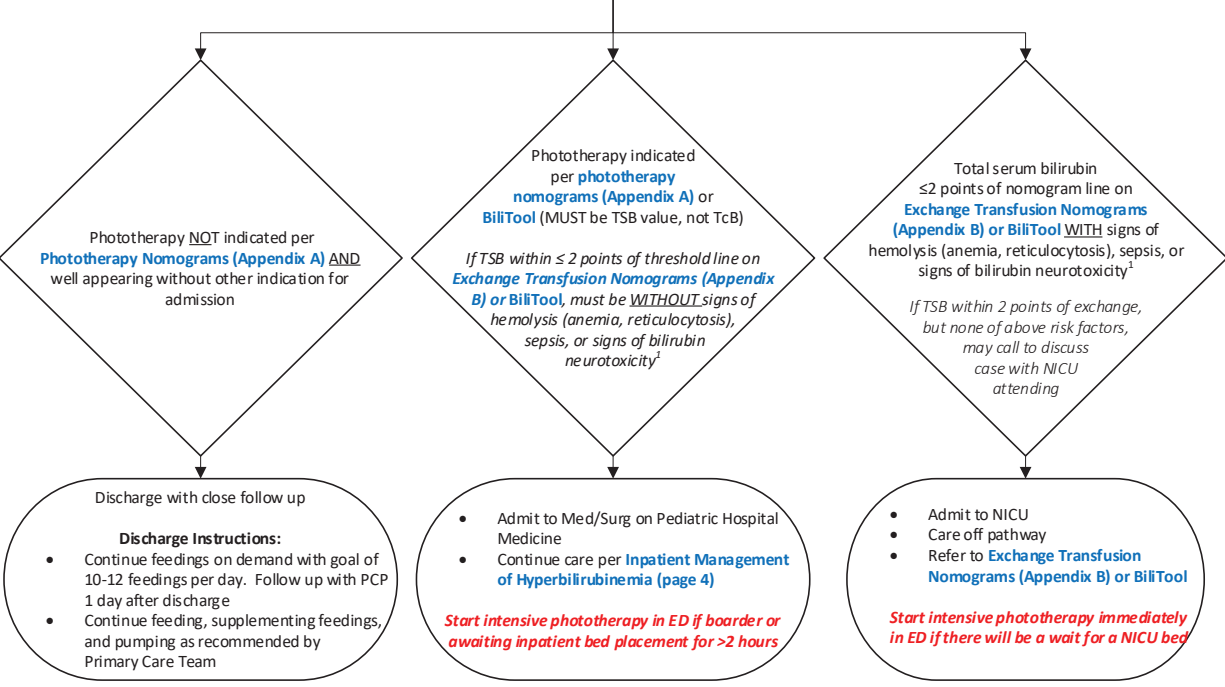
- Consider etiologies and risk factors for neonatal hyperbilirubinemia (Appendix C)
- Determine if there is pathologic rate of rise (≥ 0.2mg/dL/hour or > 5mg/dL in 24 hours)
- Determine threshold for phototherapy and exchange transfusion using BiliTool or Phototherapy Nomograms (Appendix A) and Exchange Transfusion Nomograms (Appendix B)

**Laboratory:** Consider additional labs as clinically indicated

- CBC w diff, reticulocyte count, DAT, (if not known), type and screen, peripheral smear - If mother/baby blood types unknown, early-onset jaundice (first 24 hrs after birth), phototx or exchange transfusion during birth hospitalization, bilirubin levels w/in 2 mg/dL of threshold in 1<sup>st</sup> 48 hrs of life, rapidly rising TSB levels (increasing by ≥0.2 mg/dL per hour), ABO incompatibility regardless of DAT result, family hx inherited hemolytic disorder
- G6PD - if clinical concern for hemolysis and DAT negative, or if early onset hyperbili and persistent beyond first week of life, familial or racial or ethnic risk
- Electrolytes, POCT urine dip for specific gravity - Obtain if concern for moderate or severe dehydration
- Additional labs considerations (if clinically indicated): Liver panel and albumin; blood, urine, CSF cultures/counts

**FEN/GI:**

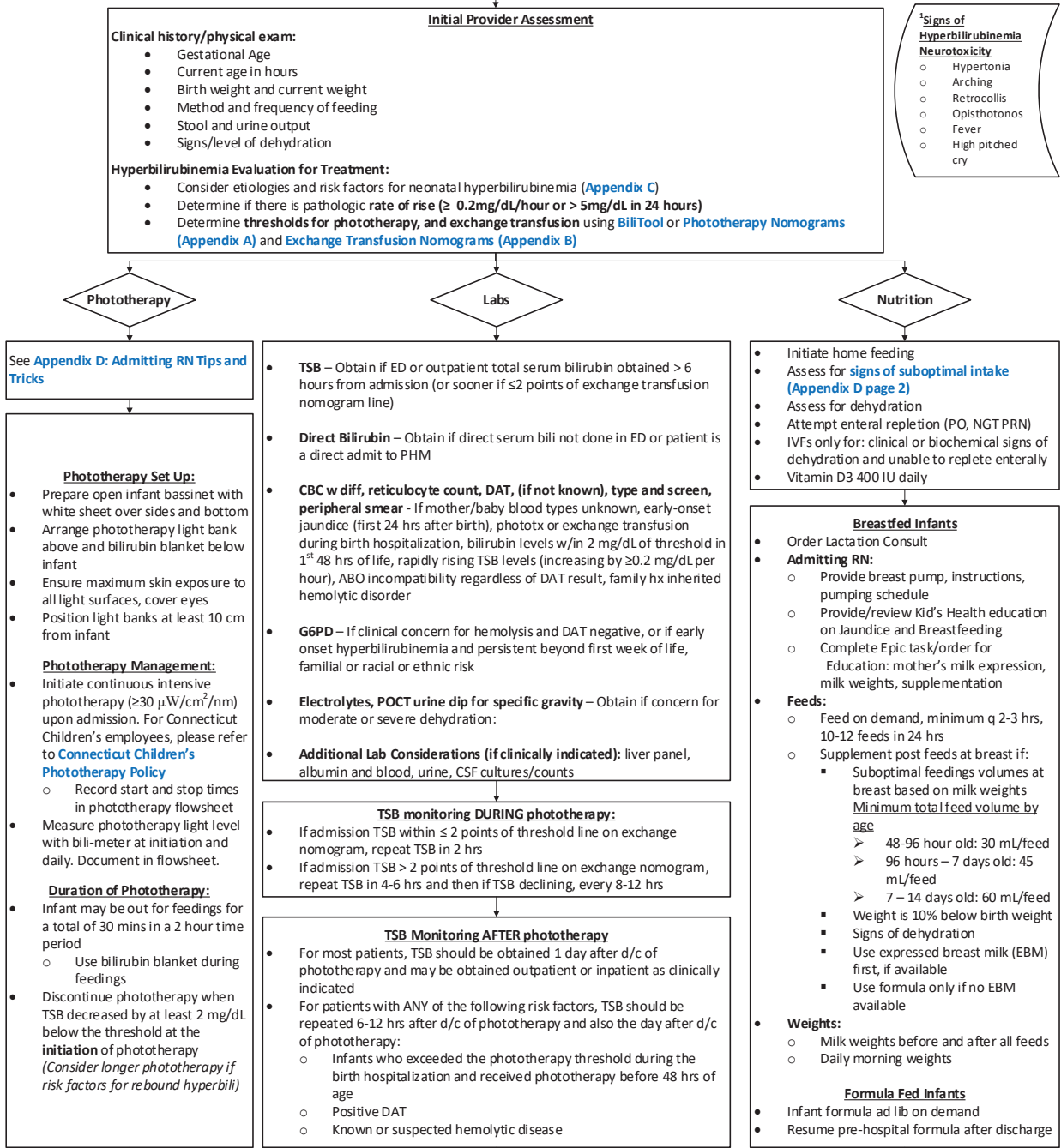
- Initiate home feeding
- Provide breastfeeding mothers with breast pump, kit, and pumping instructions if prolonged ED stay
- Attempt enteral repletion of hydration (PO or NG)
- IV hydration only if severe dehydration or electrolyte abnormalities



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**Discharge Criteria:**  
 Acceptable TSB level; taking adequate intake as defined by multidisciplinary team; absence of excessive weight loss; adequate follow up plan with PCP; confirm breast pump available for home for breastfeeding infants; follow appointments in place (PCP with in 1-2 days after discharge, lactation consultant if indicated); VNA referral for weight checks and feeding assessment to alternate with PCP follow up if indicated

**Discharge Instructions:**  
 Continue feedings on demand with goal of 10-12 feedings per day; follow up with PCP 1 day after discharge; continue feeding, supplementing feedings, and pumping as recommended by multidisciplinary team including lactation consultant



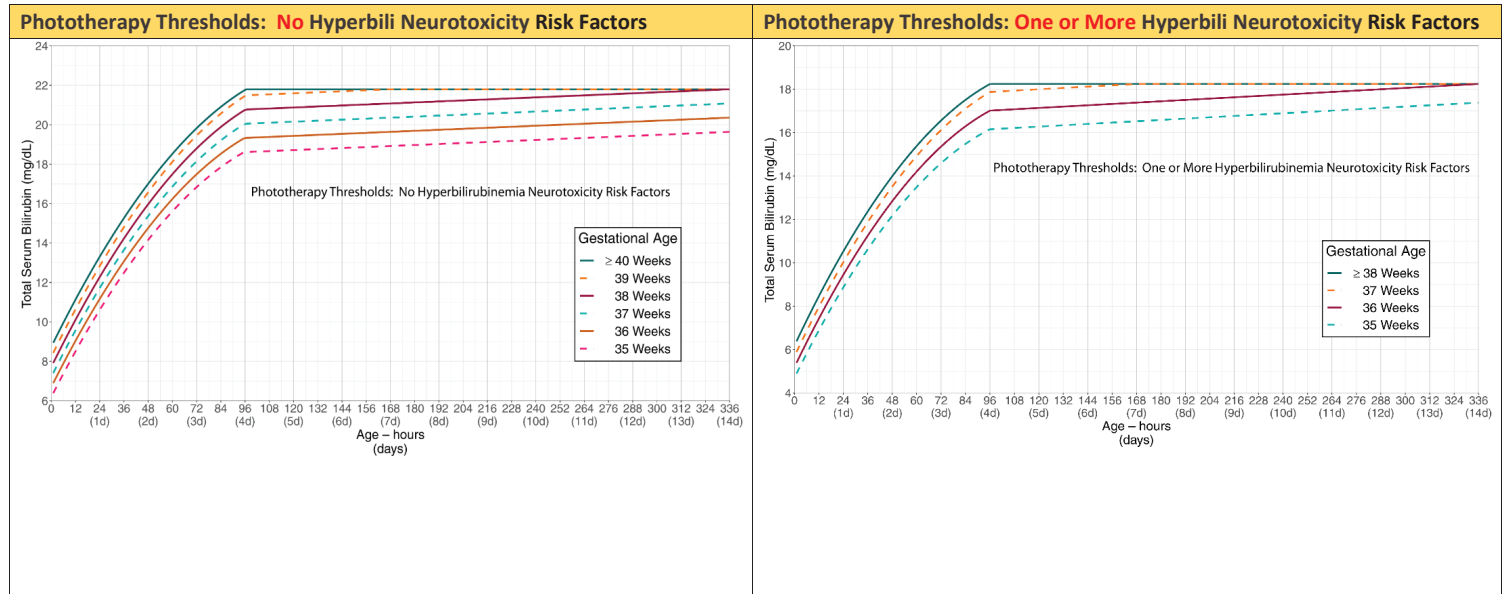
# CLINICAL PATHWAY: Hyperbilirubinemia in the Neonate Appendix A: Phototherapy Nomogram

THIS PATHWAY  
SERVES AS A GUIDE  
AND DOES NOT  
REPLACE CLINICAL  
JUDGMENT.

## Phototherapy Nomograms May use [www.bilitool.org](http://www.bilitool.org) to plot patient.

### Hyperbilirubinemia Neurotoxicity Risk Factors:

Albumin <3.0 g/dL; isoimmune hemolytic disease, glucose-6-phosphate dehydrogenase (G6PD) deficiency, or other hemolytic conditions; sepsis; or any significant clinical instability in the previous 24 hours.



**Adapted from:** Kemper, A. R., et al. (2022). Clinical Practice Guideline Revision: Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation. *Pediatrics*, 150(3), e2022058859.

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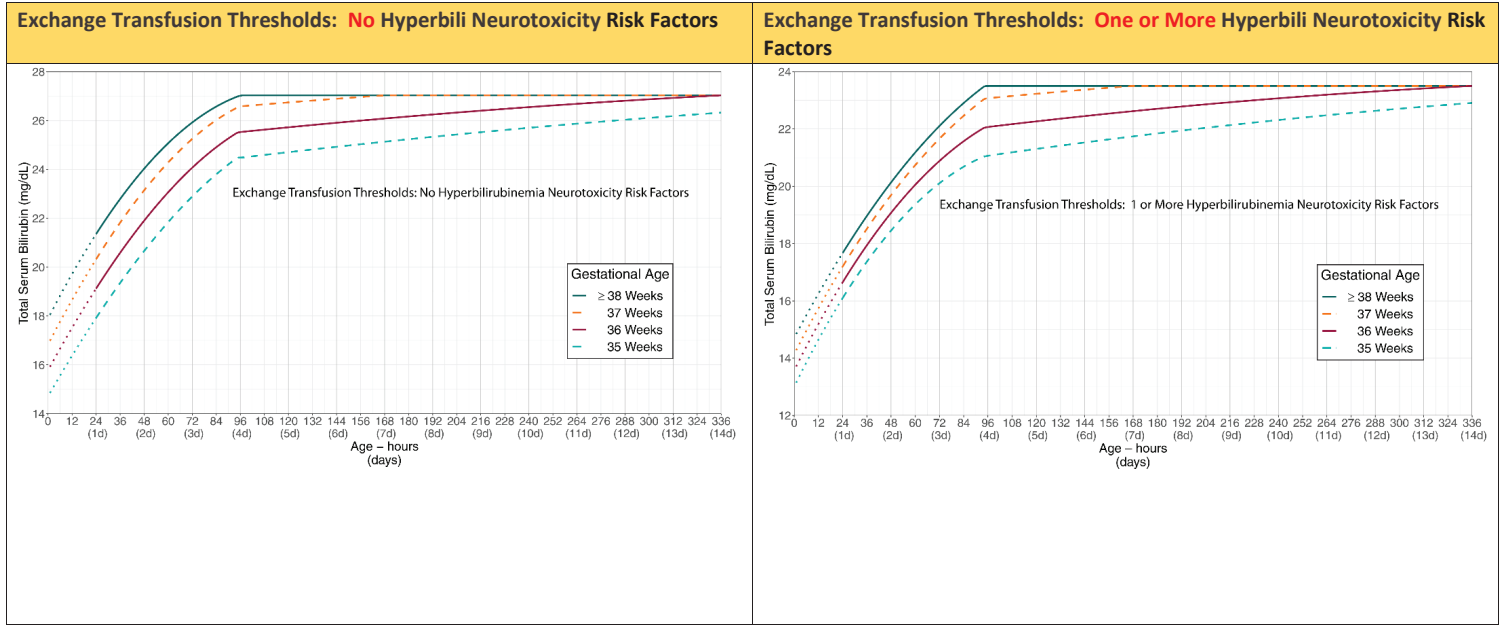


**Exchange Transfusion Nomograms**

May use [www.bilitool.org](http://www.bilitool.org) to plot patient.

**Hyperbilirubinemia Neurotoxicity Risk Factors:**

Albumin <3.0 g/dL; isoimmune hemolytic disease, glucose-6-phosphate dehydrogenase (G6PD) deficiency, or other hemolytic conditions; sepsis; or any significant clinical instability in the previous 24 hours.



**Figure Legend:** These thresholds are based on expert opinion rather than strong evidence on when the potential benefits of escalation of care exceed its potential harms. The stippled lines for the first 24 hours indicate uncertainty because of the wide range of clinical circumstances and responses to intensive phototherapy. Use total serum bilirubin concentrations; do not subtract direct bilirubin from the total serum bilirubin. In rare cases of severe hyperbilirubinemia in which the direct-reacting or conjugated bilirubin exceeds 50% of the TSB, consult an expert.

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**Etiologies of Hyperbilirubinemia**

<p style="text-align: center;"><b><u>Increased Bilirubin Production</u></b></p> <ul style="list-style-type: none"> <li>• <b>Hemolytic Disease</b> <ul style="list-style-type: none"> <li>○ Isoantibodies <ul style="list-style-type: none"> <li>▪ ABO</li> <li>▪ Rh</li> <li>▪ Minor antibodies</li> </ul> </li> <li>○ Enzyme defects <ul style="list-style-type: none"> <li>▪ Glucose-6-phosphate deficiency</li> <li>▪ Pyruvate kinase deficiency</li> </ul> </li> <li>○ Structural defects <ul style="list-style-type: none"> <li>▪ Spherocytosis</li> <li>▪ Elliptocytosis</li> </ul> </li> </ul> </li> <li>• <b>Birth trauma</b> <ul style="list-style-type: none"> <li>○ Scalp hematoma</li> <li>○ Excessive bruising</li> </ul> </li> <li>• <b>Polycythemia</b></li> </ul>	<p style="text-align: center;"><b><u>Other or Combined Etiologies</u></b></p> <ul style="list-style-type: none"> <li>• <b>Family history of inherited hemolytic disorders</b></li> <li>• <b>Prematurity</b></li> <li>• <b>Metabolic disorder</b> <ul style="list-style-type: none"> <li>○ Hypothyroidism</li> <li>○ Galactosemia</li> </ul> </li> <li>• <b>Infection</b> <ul style="list-style-type: none"> <li>○ Urinary tract infection</li> <li>○ Sepsis</li> </ul> </li> <li>• <b>Breastfeeding (non-breastfeeding/starvation jaundice)</b></li> <li>• <b>Drugs</b> <ul style="list-style-type: none"> <li>○ Sulfisoxazole</li> <li>○ Streptomycin</li> <li>○ Benzyl alcohol</li> <li>○ Chloramphenicol</li> </ul> </li> </ul>
<p style="text-align: center;"><b><u>Decreased Bilirubin Excretion</u></b></p> <ul style="list-style-type: none"> <li>• <b>Biliary obstruction</b> <ul style="list-style-type: none"> <li>○ Biliary atresia</li> <li>○ Choledochal cyst</li> <li>○ Dubin-Johnson syndrome</li> <li>○ Rotor syndrome</li> </ul> </li> </ul>	<p style="text-align: center;"><b><u>Impaired Bilirubin Conjugation</u></b></p> <ul style="list-style-type: none"> <li>• Gilbert syndrome</li> <li>• Crigler-Najjar syndrome I and II</li> <li>• Human milk jaundice</li> </ul>

**Risk Factors to Consider**

<p style="text-align: center;"><b><u>Risk Factors for Development of Significant Hyperbilirubinemia for Infants ≥ 35 Weeks Gestation</u></b></p> <ul style="list-style-type: none"> <li>• Lower gestational age (ie, risk increases with each week &lt; 40 weeks)</li> <li>• Jaundice observed in first 24 hours after birth</li> <li>• Predischarge from birth hospital TcB or TSB close to phototherapy threshold</li> <li>• Phototherapy before birth hospital discharge</li> <li>• Blood group incompatibility <ul style="list-style-type: none"> <li>○ Positive direct antiglobulin test</li> <li>○ Other hemolytic disease (G6PD)</li> <li>○ Elevated ETCO<sub>2</sub></li> </ul> </li> <li>• Parent or sibling requiring phototherapy or exchange transfusion</li> <li>• Family history or genetic ancestry suggestive of inherited red blood cell disorders, including G6PD</li> <li>• Scalp hematoma or significant bruising</li> <li>• Down syndrome</li> <li>• Macrosomic infant of a diabetic mother</li> </ul>	<p style="text-align: center;"><b><u>Risk Factors for Hemolysis</u></b></p> <ul style="list-style-type: none"> <li>• Early onset jaundice (within 1<sup>st</sup> 24 hours after birth)</li> <li>• Requirement for phototherapy or exchange transfusion during the birth hospitalization</li> <li>• Near-threshold bilirubin levels within the first 48 hours after birth (within 2mg/dL of phototherapy threshold)</li> <li>• Rapidly rising TSB levels (increasing by ≥ 0.3 mg/dL per hour in the 1<sup>st</sup> 24 hours or ≥ 0.2 mg/dL per hour thereafter)</li> <li>• ABO incompatibility, regardless of DAT</li> <li>• Familial or racial or ethnic history of inherited hemolytic disorder</li> </ul>
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### Setting up for Admission:

- **Review Phototherapy Nursing Policy**
- **Gather equipment (location listed in table below)**
- **Set up for Phototherapy**
  - White sheet should be covering all sides of open bassinet, and infant placed on top of sheet
  - Bilirubin blanket should be placed in bassinet and will be beneath infant, overhead lights above
  - Overhead lights slide underneath cot
  - Overhead lights no closer than 30 cm to infant as per manufacturer recommendations
  - Goal dose of phototherapy is  $\geq 30 \mu\text{W}/\text{cm}^2/\text{nm}$  – assessed with bili-meter at time of set up and once daily on MS floors

Equipment	Location
Open cot/bassinet	One cot designated for MedSurg units, usually found in back storage hallway (MS7), otherwise call NICU and 5-TEAM will deliver
Isolette (incubator) – only when indicated for critically ill, premature, temperature concerns	NICU
Overhead Phototherapy Lights	Equipment Depot
Bilirubin Blanket	Equipment Depot
Bilirubin Blanket Disposable Pad Covers	MS6 and MS7 Omni
Bilimeter (radiometer)	Equipment Depot
Purple eye shields	MS6 and MS7 Omni
Breast Pump and Supplies	Equipment Depot/ Omni
Milk weight scale	MS Clean Storage Room
White linen	MS Clean Utility/Storage Rooms



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## **RN Responsibilities Upon Admission:**

### **1. Phototherapy and Bilirubin Labs Tips**

- Obtain Total Serum Bilirubin if > 2 hours since last and then start phototherapy
- Start continuous intensive phototherapy ( $\geq 30 \mu\text{W}/\text{cm}^2/\text{nm}$ ) with lights above and bilirubin blanket beneath patient - when infant arrives
- Adjusting the phototherapy dose
  - Measure the irradiance (light intensity) of the phototherapy with the Bili-meter
  - Loosen the height adjustment clamp on the stand and adjust the height of the phototherapy unit to achieve an irradiance goal of at least  $\geq 30 \mu\text{W}/\text{cm}^2/\text{nm}$ .
  - Minimum clearance between the lower edge of the phototherapy lamp and the patient is at least 30 cm per manufacturer guidelines.
  - Infant is only wearing a diaper to maximize skin to light exposure
  - Purple eye shields in place on infant
  - Light intensity level should be checked at initiation of phototherapy and at least once a day with bili-meter. **Goal intensity is  $\geq 30 \mu\text{W}/\text{cm}^2/\text{nm}$ .** (blanket meter is tan, overhead light meter is blue)
- Document on “Phototherapy Flowsheet”: start, stop, and any phototherapy documentation items in this flow sheet

### **2. Breastfeeding and Nutrition Support Upon Patient Arrival**

- **Breast pump and pumping kit**
  - Instruct breastfeeding mother on **use of the pump** and to **pump after all feedings**
  - Complete/document completion of this order/task by clicking “done” in Epic
- **Milk weight scale**
  - Instruct mother on how to weigh the baby pre and post feedings
  - **Milk weights** are to be done for **all feedings** at breast and recorded on flow sheet
- **Provide mother a breastfeeding log (Appendix E)**
- **Document** that breast pump, pumping kit, pumping instructions, milk weight scale, and feeding log were given to mother
- Print off “**Breastfeeding and Jaundice**” patient hand out from **Kids Health** and review with mother
- **Assess feedings** at breast for **suboptimal intake**
  - Goal total feed volume by age
    - 48-96 hour old: 30 mL/feed
    - 96 hours – 7 days old: 45 mL/feed
    - 7 – 14 days old: 60 mL/feed
  - Ineffective latch and/or suck
  - Sleepy and difficulty to wake for feedings
  - Delayed milk supply
  - Laboratory abnormalities (hypoglycemia)
  - Uric acid crystals in urine
  - < 4 stools on day 4 or meconium stools on day 5



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**CLINICAL PATHWAY:**  
**Hyperbilirubinemia in the Neonate**  
**Appendix E: Feeding Log**

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 AND DOES NOT  
 REPLACE CLINICAL  
 JUDGMENT.

**Feeding Record**

CCMC Lactation Services: 860-545-8300

Date	Time	Y/N	Breastfeed		Bottle feed		NG/OG		Diapers		Pump
			Milk Weight	BF Amount	Breast Milk Amount	Formula Amount	Breast Milk Amount	Formula Amount	Wet Diaper	Stool Diaper	Amount Pumped
			pre-feed post-feed								
			pre-feed post-feed								
			pre-feed post-feed								
			pre-feed post-feed								
			pre-feed post-feed								
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**Feeding Plan**

Date:



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