Date Finalized: July 2023

Hyperbilirubinemia **Clinical Pathway Synopsis**

Hyperbilirubinemia - Screening Algorithm

Exclusion Criteria

- Newborn is known to have direct hyperbilirubinemia
- Newborn is < 35 weeks gestation
- Newborn has received home phototherapy

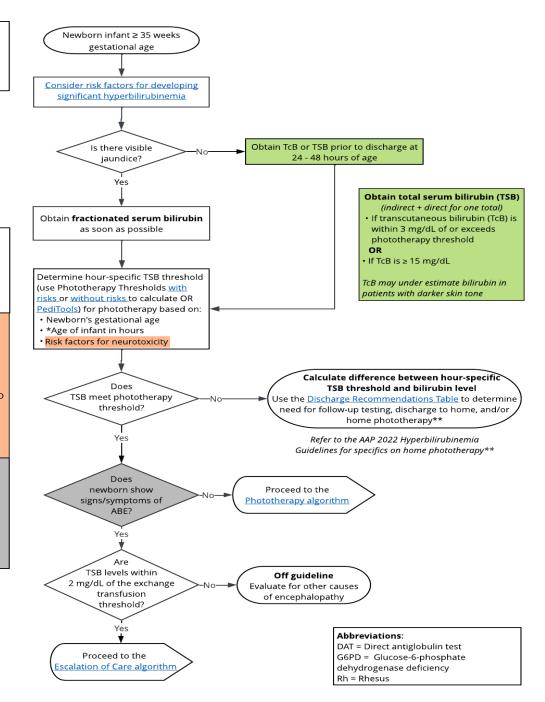
*If newborn is less than 24 hours old with a TSB at or above the phototherapy threshold- they are likely to have a hemolytic process and should be evaluated for hemolytic disease.

Hyperbilirubinemia Neurotoxicity Risk Factors

- Gestational age < 38 wks (risk increases with the degree of prematurity)
- Albumin < 3.0 g/dL
- Isoimmune hemolytic disease (i.e., positive direct antiglobulin test), G6PD deficiency, or other hemolytic conditions
- Sepsis
- · Significant clinical instability in the previous 24 hours

Signs/Symptoms of Acute Bilirubin **Encephalopathy (ABE)**

- Lethargy
- · Hyper- or hypotonia
- Poor suck
- High-pitched cry
- · Recurrent apnea
- Opisthotonos Retrocollis
- Seizures



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Hyperbilirubinemia - Phototherapy Algorithm

Newborn ≥ 35 weeks gestation suspected to meet Inclusion Criteria: criteria for phototherapy - recheck using Peditools Newborn ≥ 35 weeks (Screening algorithm) Treatment thresholds are higher than in previous guidelines gestation having a TSB 2022 AAP guideline within 3 mg/dL of or exceeding the phototherapy threshold Before initiating phototherapy, complete the following labs: and/or has an associated Confirmatory fractionated TSB level - if no recent (within 6 hours) risk factor fractionated TSB level or only has TcB CBC w/ differential **Exclusion Criteria: Hemolysis Testing** Test for hemolysis, if not already performed · Obtain DAT if mother has O or RhD Newborn ≥ 35 weeks gestation with direct negative blood types OR positive maternal antibody screen hyperbilirubinemia If hemoglobin is low, obtain: Newborn whose TSB levels Phototherapy are ≥ 3 mg/dL below · Reticulocyte count · Position newborn supine w/diaper only and opaque orbital shield phototherapy threshold · Peripheral blood smear · Maximize skin exposure and treatment time G6PD enzyme activity and shows no signs of any · Deliver phototherapy from above and below associated risk factors or Minimize interruptions to phototherapy G6PD activity should be measured in any acute bilirubin infant with jaundice of unknown cause: encephalopathy Newborn < 35 weeks · Whose TSB increases despite intensive phototherapy Monitoring gestation Whose TSB increases suddenly or Newborn has received Documentation of phototherapy start and stop times increases after an initial decline home phototherapy · Vital signs q4 hours · Monitor intake & urinary output q4 hours · TSB levels within 12 hours of starting phototherapy Who requires escalation of care Are TSB levels at or above the Escalation beyond exchange transfusion phototherapy threshold? No Risks for Rebound Hyperbilirubinemia Exceeded phototherapy threshold during · Verify correct phototherapy administration and adjust as needed birth hospitalization AND · Minimize interruptions for feeding and holding a. Received phototherapy < 48 hours of age Continue to measure TSB as clinically indicated based on: OR Age of patient b. Positive DAT OR · Neurotoxicity risk factors c. Known or suspected hemolytic disease · TSB level and trajectory Inadequate feeding Neurotoxicity risk factors No Has TSB decreased by a Does Repeat TSB 6-12 hours after newborn have risks for minimum of 2 mg/dL below discontinuation (DO NOT the hour-specific threshold rebound hyperdischarge until TSB result is bilirubinemia? at the initiation of back) therapy? Resume treatment if No indicated, otherwise proceed Abbreviations: to discontinuation TSB = Total Serum Bilirubin Discontinue phototherapy. TcB = Transcutaneous Bilirubin Repeat bilirubin (TSB or TcB) 24-48 hours after DAT = Direct antiglobulin test Rh = Rhesus discontinuation in the inpatient or outpatient setting. Resume treatment if indicated G6PD = Glucose-6 phosphate dehydrogenase Consider other clinical risk factors for significant

nyperbilirubinemia to guide additional follow-up

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Hyperbilirubinemia - Escalation of Care Algorithm

Newborn ≥ 35 weeks gestation with **Inclusion Criteria** hyperbilirubinemia meets inclusion criteria for ANY of the following: care escalation · Signs of acute bilirubin encephalopathy (ABE) Rapidly rising TSB levels Contact ICN doctor on call for urgent TSB levels within 2 mg/dL of the direct admit or transfer for potential exchange transfusion threshold exchange transfusion with risk factors, without risk factors, PediTool • Send STAT labs **Exclusion Criteria Exchange Transfusion** Notify blood bank Newborn has direct Cross-matched washed-packed · Measure TSB at min of q2hours hyperbilirubinemia red blood cells mixed with · Consider placing central line and be prepared for Newborn is < 35 weeks gestation thawed adult fresh-frozen exchange transfusion Newborn has received home plasma to a hematocrit Initiate emergent intensive phototherapy and phototherapy approximating 40% is preferred. PO + IV hydration **STAT Labs** • TSB Serum Direct serum chemistries Does the bilirubin Type and newborn · CBC crossmatch have any signs of ABE? G6PD enzyme Serum albumin OR · Continue intensive phototherapy and IV activity if not Is the latest TSB ≥ the exchange hydration already transfusion threshold (PediTool)? Repeat TSB levels q2hours obtained OR Monitor for signs of ABE **IV** Hydration Is B/A ratio above the threshold Crystalloid fluid of 10% dextrose for exchange with 1/4 NS at maintenance rate transfusion? 60-80 mL/kg/day for newborns < 48 hrs old • 80-100 mL/kg/day for newborns ≥ 48 hours old Yes Signs/Symptoms of acute bilirubin encephalopathy (ABE) isoimmune Lethargy hemolytic disease · Hyper- or hypotonia suspected? Poor suck · High-pitched cry Does the · Recurrent apnea newborn Yes Opisthotonos have any signs of ABE? Retrocollis OR Seizures Administer IVIG Is the latest TSB ≥ the exchange No 0.5 - 1.0 g/kg over 2 hours transfusion threshold (PediTool)? Repeat dose q12hours prn OR Abbreviations: Is B/A ratio above the threshold TSB = Total serum bilirubin for exchange B/A ratio = index of the amount of transfusion? bilirubin bound to albumin DAT = Direct antiglobulin test IVIG = Intravenous immunoglobulin Continue intensive Make NPO phototherapy and IV hydration Provide exchange transfusion · Repeat TSB levels q2hrs · Continue phototherapy during · Monitor for signs of ABE and after exchange transfusion Continue intensive phototherapy and monitoring

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Objective of Clinical Pathway

To provide care standards for the newborn patient ≥ 35 weeks gestational age and guide the provider on screening, risk assessment, monitoring, and treatment of newborns at risk of developing hyperbilirubinemia.

Epidemiology

Hyperbilirubinemia is among the most prevalent conditions in term or late pre-term neonates, with 60%-80% of these neonates developing jaundice in their first week after birth (Ansong-Assoku et al., 2022). Newborn jaundice is often benign and the result of the immature liver's decreased ability to clear bilirubin (Burke et al., 2009; Young Infants Clinical Signs Study Group, 2008). Providers caring for newborns must intentionally monitor and provide appropriate interventions to address the 8%-11% of these newborns who will develop severe hyperbilirubinemia, as severe hyperbilirubinemia can lead to more serious conditions such as acute bilirubin encephalopathy and kernicterus (Maisels, et al., 2004).

Due to the prevalence and potential complexities of hyperbilirubinemia, the Hyperbilirubinemia Clinical Pathway Committee developed this pathway to guide providers through the identification, evaluation, and treatment of neonates with indirect hyperbilirubinemia.

Target Users

- Neonatologists
- · Newborn nursery providers
- Hospitalists
- Primary care pediatricians
- Emergency Medicine providers
- Advanced Practice Nurses
- · Residents and fellows

Target Population

Inclusion Criteria - Screening

- All newborns ≥ 35 weeks gestational age.
- Early screening will be completed on those newborns ≥ 35 weeks gestational age that meet one of the following criteria:
 - Positive direct antiglobulin test (DAT will be obtained automatically when the mother has type O blood or is Rh negative)
 - o Newborn has an onset of visible jaundice within the first 24 hours after birth
 - The newborn has a first-degree relative with a heritable hemolytic disease (i.e., G6PD deficiency or hereditary spherocytosis)

Exclusion Criteria- Screening

- · Newborn known to have direct hyperbilirubinemia
- Newborn is < 35 weeks gestation
- Newborn has received home phototherapy

Inclusion Criteria - Phototherapy

- Newborns ≥ 35 weeks gestational age having a total serum bilirubin (TSB is the total of both direct and indirect serum bilirubin levels) within 3 mg/dL of or exceeding the phototherapy threshold and/or have associated risk factors.
- Neurotoxicity risk factors include gestational age < 38 weeks (risk increases with the degree of prematurity), albumin < 3.0 g/dL, isoimmune hemolytic disease, sepsis, or significant clinical instability in the previous 24 hours. Newborns ≥ 35 weeks gestational age having total serum bilirubin < 2mg/dL below the phototherapy threshold and demonstrate clinical risk factors for progressive hyperbilirubinemia
 - Progressive hyperbilirubinemia risk factors include early onset of jaundice (within the first 24 hours after birth), rapidly rising bilirubin levels, significant bruising or cephalohematoma, or Rh incompatibility

Exclusion Criteria- Phototherapy

- Newborn TSB levels are ≥ 3mg/dL below the phototherapy threshold and show no signs of any associated risk factors or acute bilirubin encephalopathy.
- Newborn has received home phototherapy.

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Inclusion Criteria - Escalation of Care

- Newborn ≥ 35 weeks gestational age having any of the following:
 - Signs of acute bilirubin encephalopathy (ABE)
 - Rapidly rising TSB levels
 - o TSB levels within 2 mg/dL below the exchange transfusion threshold

Exclusion Criteria- Escalation of Care

- Newborn has direct hyperbilirubinemia
- Newborn is < 35 weeks gestation
- Newborn receiving home phototherapy

AGREE II

The hyperbilirubinemia national guideline that provided guidance to the Hyperbilirubinemia Clinical Pathway Committee (Kemper et al., 2022). See Table 1 for AGREE II.

Table 1

AGREE II^a Summary for the American Academy of Pediatrics (Kemper et al., 2022) Clinical Practice Guideline

Domain	Percent Agreement	Percent Justification [^]
Scope and purpose	97%	The aim of the guideline, the clinical questions posed, and target populations were identified.
Stakeholder involvement	96%	The guideline was developed by the appropriate stakeholders and represents the views of its intended users.
Rigor of development	72%	The process used to gather and synthesize the evidence, the methods to formulate the recommendations and to update the guidelines were explicitly stated. The guideline developers did no t clearly state strengths and limitations of the body of evidence.
Clarity and presentation	99%	The guideline recommendations are clear, unambiguous, and easily identified; in addition, different management options are presented.
Applicability	75%	Barriers and facilitators to implementation, strategies to improve utilization and resource implications were addressed in the guideline.
Editorial independence	100%	The recommendations <u>were not</u> biased with competing interests. It is <u>unclear</u> if the recommendations were biased by competing interests.
Overall guideline assessment	97%	
Cas Dunation Dags		

See Practice Recommendations

Note: Four EBP Scholars completed the AGREE II on this guideline.

Practice Recommendations

Please refer to the American Academy of Pediatrics Clinical Practice Guidelines on the Management of Hyperbilirubinemia in Infants 35 or More Weeks Gestation (Kemper et al., 2022) for full practice recommendations, evaluation, and treatment recommendations.

Additional Questions Posed by the Clinical Pathway Committee

No additional clinical questions were posed for this review.

Recommendation Specific for Children's Mercy

Children's Mercy adopted the majority of the practice recommendations made by the American Academy of Pediatrics Guidelines on the Management of Hyperbilirubinemia in Infants 35 or More Weeks Gestation (Kemper et al., 2022). Variations/additions include:

• Providers are to obtain a fractionated serum bilirubin (direct and indirect provided separately) as soon as possible once a newborn ≥ 35 weeks of gestational age with indirect hyperbilirubinemia has visible jaundice. Fractionated serum bilirubin should also be obtained for any newborn meeting the criteria for treatment.

Percentage justification is an interpretation based on the Children's Mercy EBP Department standards.

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Measures

- Utilization of the Hyperbilirubinemia Clinical Pathway
- Utilization of the Hyperbilirubinemia-associated power plans
- Rate of readmission for hyperbilirubinemia

Value Implications

The following improvements may increase value by reducing healthcare costs and non-monetary costs (e.g., missed school/work, loss of wages, stress) for patients and families and reducing costs and resource utilization for healthcare facilities.

- Decreased risk of over- or undertreatment with phototherapy
- Decreased rate of admissions for those newborns who do not meet criteria for treatment based on the updated AAP guideline.
- Decreased unwarranted variation in care

Potential Organizational Barriers and Facilitators Potential Barriers

- Variability of an acceptable level of risk among providers
- Challenges with follow-up faced by some families

Potential Facilitators

- Collaborative engagement across care continuum settings during clinical pathway development
- Anticipated high rate of use of the clinical pathway
- Standardized order set for the Emergency Department, Hospital Medicine, and Intensive Neonatal Care
- All newborns ≥ 35 weeks gestational age are screened as the standard of care, increasing equity of care

Diversity/Equity/Inclusion

Our aim is to provide equitable care. These issues were discussed with the Committee, reviewed in the literature, and discussed before making any practice recommendations.

Power Plans

- Hyperbilirubinemia
- ICN Hyperbilirubinemia

Associated Policies

- Exchange Transfusion Procedure (Neonatal) (2023)
- Hyperbilirubinemia Testing Standing Order (2023)
- Safe Sleep Practices for Hospitalized Infants (2021)
- Transcutaneous Bilirubinometer Procedure for Newborn Jaundice Assessment (2022)
- Transcutaneous Bilirubinometer (TcB) Newborn Jaundice Assessment Standing Order (2022)

Education Materials

- Available via Children's Mercy electronic medical records for depart instructions:
 - Search for jaundice or hyperbilirubinemia to find 'Hyperbilirubinemia, Indirect, Age < 3months'
- Available via the Children's Mercy public website and can be accessed by internal and external providers as well as caregivers:
 - https://kidshealth.org/ChildrensMercy/en/ direct parents or caregivers to this website and there
 they will find a search area to look up information on jaundice

Clinical Pathway Preparation

This product was prepared by the Evidence Based Practice (EBP) Department in collaboration with the Hyperbilirubinemia Clinical Pathway Committee, composed of content experts at Children's Mercy Kansas City. The development of this product supports the Quality Excellence and Safety Division's initiative to promote care standardization that is evidenced by measured outcomes. If a conflict of interest is identified, the conflict will be disclosed next to the committee member's name.

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Hyperbilirubinemia Clinical Pathway Committee Members and Representation

- Kristie Marble, DO, FAAP | Hospital Medicine | Committee Chair
- Giang Nguyen, MD, FAAP | Hospital Medicine | Committee Member
- Deborah Holland, MD | Hospital Medicine | Committee Member
- Dena Hubbard, MD, FAAP | ICN | Committee Member
- Sian Best, MD | Hospital Medicine | Committee Member
- Megan Collins, MD, MPH | Hospital Medicine | Committee Member

EBP Committee Members

- Kathleen Berg, MD, FAAP | Hospitalist, Evidence Based Practice
- Andrea Melanson, OTD, OTR/L | Evidence Based Practice

Clinical Pathway Development Funding

The development of this pathway was underwritten by the following departments/divisions: Hospital Medicine, Neonatal Intensive Care Department, and Evidence Based Practice.

Conflict of Interest

The contributors to the Hyperbilirubinemia Clinical Pathway have no conflicts of interest to disclose related to the subject matter or materials discussed.

Approval Process

- This product was reviewed and approved by the Hyperbilirubinemia Clinical Pathway Committee, Content Expert Departments/Divisions, and the EBP Department, after which the Medical Executive Committee approved them.
- Products are reviewed and updated as necessary every three years within the EBP Department at CMKC.
 Content expert teams are involved with every review and update.

Approval Requested

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Department/Unit	Date Approved			
Hospital Medicine	July 2023			
Intensive Care Nursery	August 2023			
Evidence Based Practice	July 2023			

Version History

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Date	Comments
August 2023	Version one – development of algorithms, synopsis, and power plans
August 2023	Version one – development of algorithms, synopsis, and power plans

Date for Next Review:

August 2026

Implementation & Follow-Up

- Once approved, the pathway was presented to appropriate care teams and implemented. Care measurements will be assessed and shared with appropriate care teams to determine if changes need to occur.
- Order sets/power plans consistent with recommendations were created or updated for each care setting.
- Education was provided to all stakeholders:

Nursing units where the hyperbilirubinemia clinical pathway is utilized

Departments of Neonatology and Hospital Medicine

Providers from Neonatology, Hospital Medicine, and the Emergency Department

Resident physicians

- Additional institution-wide announcements were made via email, the hospital website, and relevant huddles.
- Metrics will be assessed and shared with appropriate care teams to determine if changes need to occur.

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Disclaimer

When evidence is lacking or inconclusive, options in care are provided in the supporting documents and the power plan(s) that accompany the clinical pathway.

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