Care Process Model

Hyperbilirubinemia

MISSION HEALTH

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WHAT IS MULTIDISCIPLINARY CARE?

Multidisciplinary care is agreed upon, interdisciplinary, patient-centered, disease-focused, care delivery systems that are informed by a series of evidence-based Care Process Models. Multidisciplinary care supports the achievement of the BIG(GER) Aim systematically across the continuum of care.

WHAT IS A CARE PROCESS MODEL (CPM)?

Care Process Models ensure that all care delivered by a hospital and its caregivers is medically necessary, the leading edge in medical science and the appropriate treatment intensity. Put into effect, these models will systemize treatment processes across all hospitals and practices, improving consistency as well as effectiveness.

This CPM summarizes Mission Health's multidisciplinary care of hyperbilirubinemia.

WHAT ARE THE BENEFITS OF A CPM?

- Reduces variation
- Utilizes the best practice from literature and expert opinion
- Improves care delivery repetition
- More readily exposes errors
- Variation study informs revisions to CPMs

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WHY FOCUS ON HYPERBILIRUBINEMIA IN THE NEWBORN?

Approximately 60 percent of term infants and 80 percent of premature infants will experience neonatal jaundice. When jaundice appears in the second or third day of life it is usually physiologic; however, if jaundice appears at the end of the first week, it could be due to infection. Large amounts of bilirubin can circulate to brain tissues and cause seizures or brain damage, a neurologic dysfunction known as kernicterus. (7)

We convened a multidisciplinary team that discussed approach considerations and processes currently implemented. There are a variety of health providers involved in the care of newborns at Mission Health including neonatal nurse practitioners, pediatricians, pediatric nurse practitioners, and family practice physicians. The purpose of this care process model was to formalize the approach across the system, in cooperation and adherence to established guidelines set forth by the American Academy of Pediatrics written in 1994 and updated in 2004.

GOALS

- Prompt and correct diagnosis
- Reduction in frequency of severe neonatal hyperbilirubinemia and bilirubin encephalopathy
- Standardized discharge plan

ALGORITHM: CLINICAL PATHWAY FOR THE MANAGEMENT OF HYPERBILIRUBINEMIA IN TERM AND LATE PRETERM INFANTS (GREATER THAN OR EQUAL TO 35 WEEKS)

*** Total Serum Bilirubin (TSB) to be collected at 30hrs of age with Newborn Metabolic Screen. Collection recommended at 24hrs for babies with Risk Factors as outlined below.***

DO NOT collect newborn screening specimen before 24 completed hours of age

Complete Bilitool and notify LIP/AP of results if infant is in HIGH Risk Category

GA (wks) Plus Risk Factors	Bilirubin Risk Zone			
	High	High-Intermediate	Low-Intermediate	Low
GA 35 - 37 6/7 wks plus other risk factors	• Evaluate for Phototherapy • TSB in 4-8 hours	• Evaluate for Phototherapy • TSB in 4-24 hours	• If discharging less than 72 hours, follow-up within 2 days • Consider TSB at follow-up	• If discharging less than 72 hours, follow-up within 2 days
GA 35 - 37 6/7 wks with no risk factors OR Greater than or equal to 38 wks plus risk factors	• Evaluate for Phototherapy based on AAP nomogram • TSB in 4-24 hours based on AAP nomogram	• Evaluate for Phototherapy • TSB in 24 hours	• If discharging less than 72 hours, follow-up within 2 days	• If discharging less than 72 hours, follow-up within 2-3 days
Greater than or equal to 38 wks with no risk factors	• Evaluate for Phototherapy • TSB in 4-24 hours	• Follow-up within 2 days • Consider TSB at follow-up	• If discharging less than 72 hours, follow-up within 2-3 days	• If discharging less than 72 hours time follow-up according to age at discharge or concerns other than jaundice (eg, breastfeeding)

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HYPERBILIRUBINEMIA

*Risk Factors: Instrumented Delivery; Prematurity; Late Preterm; Maternal Illness (Gestational Diabetes, ABO, or Rh Incompatibility); Asian or Native American Race; Infrequent Feedings; Positive Coombs

KEY FEATURES OF MULTIDISCIPLINARY CARE OF HYPERBILIRUBINEMIA

A. Clinical Assessment for Jaundice

Jaundice should be assessed whenever the infant's vital signs are taken but no less than every 8 to 12 hours.

B. Serum Bilirubin in Jaundiced Infants in the First 24 hours

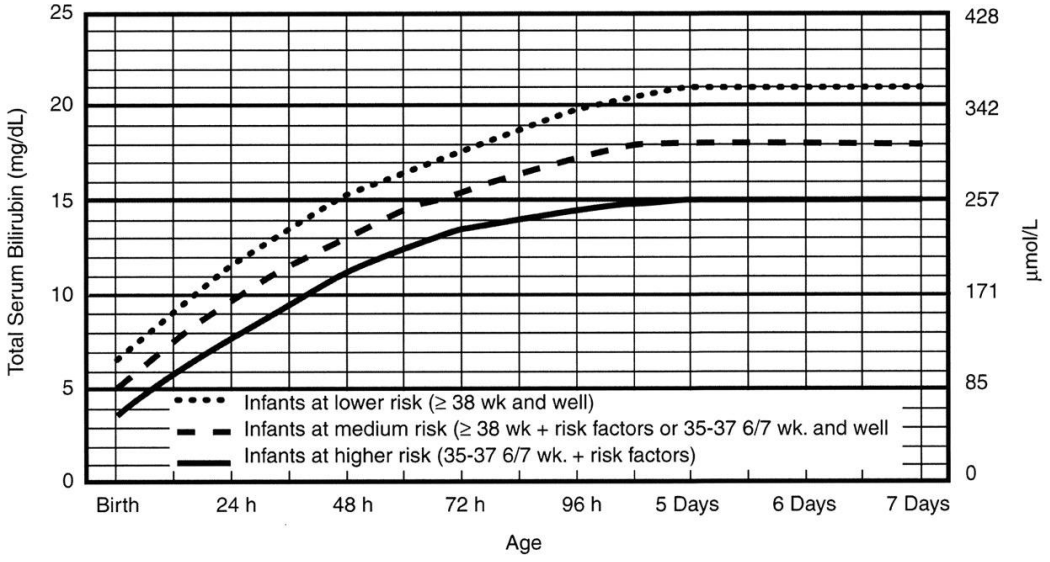
If jaundice is evident in the first 24 hours of life, the nurse caring for the infant will draw a Total Serum Bilirubin from a heel stick.

C. Serum Bilirubin in At-Risk Infants beyond 24 Hours

Many risk factors may contribute to elevated hyperbilirubinemia levels. If newborns have any of the risk factors described below, the attending physician should consider obtaining a quantitative bilirubin determination. These risk factors include, but are not limited to:

a. Gestational age less than 38 weeks
b. Breastfeeding with inadequate intake
c. Significant weight loss (defined as greater than or equal to 10% birthweight)
d. Significant bruising
e. Cephalohematoma
f. ABO/Rh incompatibility
g. Family history of glucose-6-phosphate dehydrogenase (G6PD) deficiency
h. Family history of significant neonatal hyperbilirubinemia
i. East Asian or Native American race
j. Macrosomic infant of a diabetic mother
k. Jaundice apparent any time before discharge

D. Evaluating Need for Phototherapy with AAP Recommendation



- Use TSB. Do not subtract direct reacting or conjugated bilirubin.
- Risk factors include isoimmune hemolytic disease, glucose-6-phosphate dehydrogenase deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis, or albumin less than 3 g/dL (if measured)
- For well infants 35-37 6/7 weeks gestational age, TSB levels for intervention can be adjusted around the medium risk line. It is an option to intervene at lower TSB levels for infants closer to 35 weeks and at higher TSB levels for those closer to 37 6/7 weeks.
- Conventional phototherapy in the hospital or at home is an option for infants with TSB levels 2 to 3 mg/dL less than those shown, but home phototherapy should not be used in any infant with risk factors.

"These guidelines are based on limited evidence and the levels shown are approximations. The guidelines refer to the use of intensive phototherapy which should be used when the TSB exceeds the line indicated for each category. Infants are designated as "higher risk" because of the potential negative effects of the conditions listed on albumin binding of bilirubin, the blood-brain barrier, and the susceptibility of the brain cells to become damaged by bilirubin."(1)

E. Parent Education
Written and verbal guidelines will be provided to parents regarding the nature of jaundice, the need to monitor infants for jaundice, and how monitoring should be performed.

F. Breastfeeding and Hyperbilirubinemia Prevention
The AAP Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks Gestation Guideline "strongly supports" previous AAP recommendations for breastfeeding all healthy term and near-term newborns.

Clinicians should advise mothers to nurse their infants at least 8 to 12 times per day for the first several days. Poor caloric intake and/or dehydration associated with inadequate breastfeeding may contribute to the development of hyperbilirubinemia. Increasing the frequency of nursing decreases the likelihood of subsequent significant hyperbilirubinemia in breastfed infants. Providing appropriate support and advice to breastfeeding mothers increases the likelihood that breastfeeding will be successful. The AAP recommends against routine supplementation of nondehydrated breastfed infants with water or dextrose water. Supplementation with water or dextrose water will not prevent hyperbilirubinemia or decrease total serum bilirubin (TSB) levels.(1)

DISCUSSION

As the newborn infant transitions from intrauterine to extrauterine life, there are multiple physiologic adjustments that must occur. These processes include:

- Liver maturation to assume the role of filtering and cleansing the infant's blood
  - This task was previously performed by the placenta and maternal circulation
  - Maturation may develop slowly over the period of a few days
- Red blood cell (RBC) production changes
  - Newborns have more red blood cells
  - Initial RBCs contain fetal hemoglobin, which must be replaced by RBCs with adult-like hemoglobin for oxygen-carrying capacity
- Infants often have increased bilirubin absorption from the intestines
  - Results in higher serum bilirubin levels

The elevation of serum bilirubin from these processes usually takes a few days to occur and may not be obvious at the time of discharge. As total bilirubin increases, it results in neonatal jaundice, or the yellowish discoloration of the skin or sclera caused by bilirubin deposition. This normal physiologic process, referred to as physiologic jaundice, usually resolves within 10 to 14 days after birth.

In some newborns, however, there is an underlying pathology that results in an excessive buildup of bilirubin. When bilirubin rises rapidly or exceeds the binding capacity of the infant's albumin, it circulates through the bloodstream and can pass the blood-brain barrier, setting the stage for significant neurological events.

Certain infants may be at risk for developing increased levels of bilirubin during or after their hospital course. Multiple factors may contribute to this risk including poor caloric intake, immaturity, hemolysis, and significant bruising. The problem is compounded by the fact that the peak of hyperbilirubinemia in newborns with these risks often occurs after discharge.

METRICS

- Risk factors for hyperbilirubinemia
- Total serum bilirubin (TSB)
- Type and frequency of feedings
- Percentage weight loss
- Gestational age
- Coombs status
- Phototherapy initiated
- Blood type and compatibility
- Follow-up appointment made and documented in chart

RESOURCES

During postpartum hospital stay, care providers should provide educational activities that include information explaining the rapid changes in physiology that occur in the newborn including the appearance of skin and symptoms of jaundice.

Several patient education resources are available to help educate parents:

"Baby Steps to Home," National Association of Neonatal Nurses

Healthwise: "Newborn Jaundice: Care Instructions"

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OUR BIG(GER) AIM

To get every person to their desired outcome, first without harm, also without waste and always with an exceptional experience for each person, family and team member.

ABOUT MISSION HEALTH

Mission Health, based in Asheville, North Carolina, is the state's sixth-largest health system and was recognized as one of the nation's Top 15 Health Systems from 2012-2015 by Truven Health Analytics, formerly Thomson Reuters, becoming the only health system in North Carolina to achieve this recognition. Mission Health operates six hospitals, numerous outpatient and surgery centers, post-acute care provider CarePartners, long-term acute care provider Asheville Specialty Hospital, and the region's only dedicated Level II trauma center. With approximately 10,700 employees and 2,000 volunteers, Mission Health is dedicated to improving the health and wellness of the people of western North Carolina. For more information, please visit mission-health.org or @MissionHealthNC.

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