Health Sciences North
Horizon Santé-Nord

NEO KIDS & FAMILY PROGRAM

STANDARD OF CARE

CATEGORY: Program Specific
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SUBJECT: **HYPERBILIRUBINEMIA (JAUNDICE) ASSESSMENT AND MANAGEMENT**

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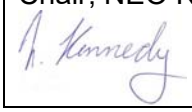
Approval: Natalie Kennedy Chair, NEO Kids & Family Program Council 	**Date:** October 8, 2020

PURPOSE

To ensure continuity of care for neonates at risk for hyperbilirubinemia (jaundice).

PROCEDURE

Special Instructions

- All infants will be assessed for risk factors, physical presentation and possible treatment of hyperbilirubinemia.
- ABO incompatibility with a positive DAT is considered a major risk factor for the development of severe hyperbilirubinemia and neurotoxicity.
- For newborns in the Birthing Centre or overflow postpartum patients on Pediatrics, use the Transcutaneous Jaundice Meter (TcB) (**Appendix A**) as a screening tool.
- If a Total Serum Bilirubin (TSB) is ordered in postpartum, follow **Appendix B**.
- For infants in the NICU, or those admitted to pediatrics that are greater than or equal to 35 weeks gestation (**Exception:** overflow postpartum patients) a TSB must be ordered by a physician. Follow **Appendix B.**
- For infants less than 35 weeks gestation, follow **Appendix C**.
- For types of phototherapy treatment, refer to **Appendix D**.

Method

Risk Factor	Description	Intervention
ABO/Rh Incompatibility	• Infants who are type A, B, or AB whose mother is type O are at higher risk for ABO incompatibility • Reaction in infants with type B blood is often most serious • For infants who are clinically jaundiced or elevated risk of needing therapy, physician may request cord blood be tested for ABORh and DAT (IgG) • If mother is Rh-Negative, the cord blood shall be processed for Rh of the newborn to determine Rhogam requirements for mother	1. If the physician has ordered cord blood testing for a clinically jaundiced infant, call the Transfusion Medicine Department (TMD) to test the stored cord blood (stored for one week). The TMD will enter the order into Meditech. 2. A blood group evaluation and a DAT are required. 3. Verify infant's blood group (ABO and Rh). 4. Obtain results of DAT. **If positive**, obtain a newborn TSB level 12 hours post-delivery. 5. Plot results on the appropriate graph. 6. Notify MRP of all results, including intake/output and any signs of sepsis.
Maternal History	• Maternal antibodies (i.e. Kell, Jk, Fy etc.)	1. Notify TMD to ensure they are aware, as newborn is at risk for hemolytic disease of the newborn. 2. TMD will test cord blood for ABORh and DAT (IgG).
Clinical Signs, Symptoms and Risk Factors	• Jaundice in the first 24 hours of life (usually begins on the face and neck and progresses to the upper trunk) • Yellowish discolouration in the sclera, nails or skin • Lethargy, feeding poorly • Inadequate stooling • Extensive bruising • Cephalohematoma • Excessive weight loss greater than or equal to 10% • Hereditary hemolytic disease (i.e. G6PD deficiency) • Gestational age 35-36 weeks of age • Asian ethnicity • Infants who are exclusively breastfeeding experiencing difficulty • History of sibling with hyperbilirubinemia	1. Assess infant for possible development of jaundice in the first 24 hours, and ongoing throughout hospital stay. 2. If jaundice present in the first 24 hours of life, obtain a newborn TSB level. 3. Plot results on the appropriate nomogram. 4. Notify MRP of all results, including intake/output and any signs of sepsis. Obtain order from MRP for further investigation or treatment, if required.

EDUCATION AND TRAINING

Definitions

1. Direct Antigen Test (Coomb's test) (DAT): A screening for antibodies present in an individual's red cells. It can be used to diagnose hemolytic disease of the newborn. The need for phototherapy is increased in ABO-incompatible infants who are DAT-positive compared with those who are DAT-negative.
2. ABORh: ABO and Rh typing and antibody screen
3. IgG: Immunoglobulin
4. MRP: Most responsible provider

References and Related Documents

Calhoun, Darlene A. Postnatal diagnosis and management of hemolytic disease of the fetus and newborn. UpToDate. Topic last updated March 23, 2020. Retrieved October 14, 2020.

Canadian Pediatric Society (2018). Position Statement: Guidelines for detection, management and prevention of hyperbilirubinemia in term and late preterm newborn infants.

Drager (2015). Sample Use Protocol Jaundice Meter JM-105.

Fiber optic phototherapy for neonatal jaundice (review). (2009). The Cochrane Collaboration; 1.

Maisels MJ, Kring E. Transcutaneous bilirubin levels in the first 96 hours in a normal newborn population of greater than or equal to 35 weeks' gestation. Pediatrics. 106; 117 (4): 1169-117.

Sick Kids Phototherapy and Exchange Transfusion Guidelines for Preterm Infants Less than 35 weeks gestation. 2016

Valsami, Serena et al. Importance of Direct Antiglobulin Test (DAT) in Cord Blood: Causes DAT (+) in a Cohort Study. Pediatrics & Neonatology. Volume 56, Issue 4, August 2015, pages 256-260.

CATEGORY: Program Specific

SUBJECT: HYPERBILIRUBINEMIA (JAUNDICE) ASSESSMENT AND MANAGEMENT

APPENDIX A

TcB Screening

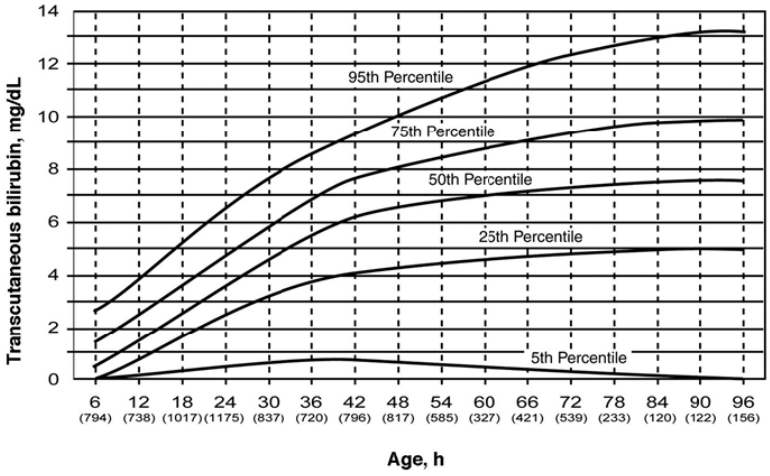
- Patients must meet the following criteria:
  - Born greater than or equal to 35 weeks gestation
  - Have not undergone transfusion or phototherapy
  - Newborns must be 72 hours of age or less
- For all results greater than or equal to the 50th percentile, a serum neonatal bilirubin test must be obtained. All values must be reported to the infant's care provider.
- For overflow postpartum patients on Pediatrics, the pediatric nurse may call the Birthing Centre to perform any required TcB tests.

Screening / Instructions for Use

1. Clean the tip of the probe with an alcohol swab.
2. Turn the power on and note the number of measurements indicated on the display. The meter is set to take five measurements, so the display will read "n-5". The average result (AVG) will be displayed beside the reading.
3. The measurement site is the neonate's mid-sternum. Place the meter probe tip flat against the infant's skin (not at an angle) and press lightly until you hear a click. Lift the meter from the skin between measurements and pause until the green ready light illuminates again. Repeat the testing procedure until the five measurements have been taken. (*Figure 1)*
4. Plot the value on the Transcutaneous Bilirubin Nomogram (*Figure 2)*
5. Notify the MRP of the results.
6. Document results on the Newborn Clinical Pathway.
7. If treatment is required, the MRP may order phototherapy treatment with the use of a biliblanket and/or phototherapy spotlight.

Figure 1

Figure 2



1. On the horizontal axis, find the infant's age in hours.
2. Follow this line up along the vertical axis to the point where it meets the TcB results you have just obtained.
3. Make a small circle where these two values intersect.

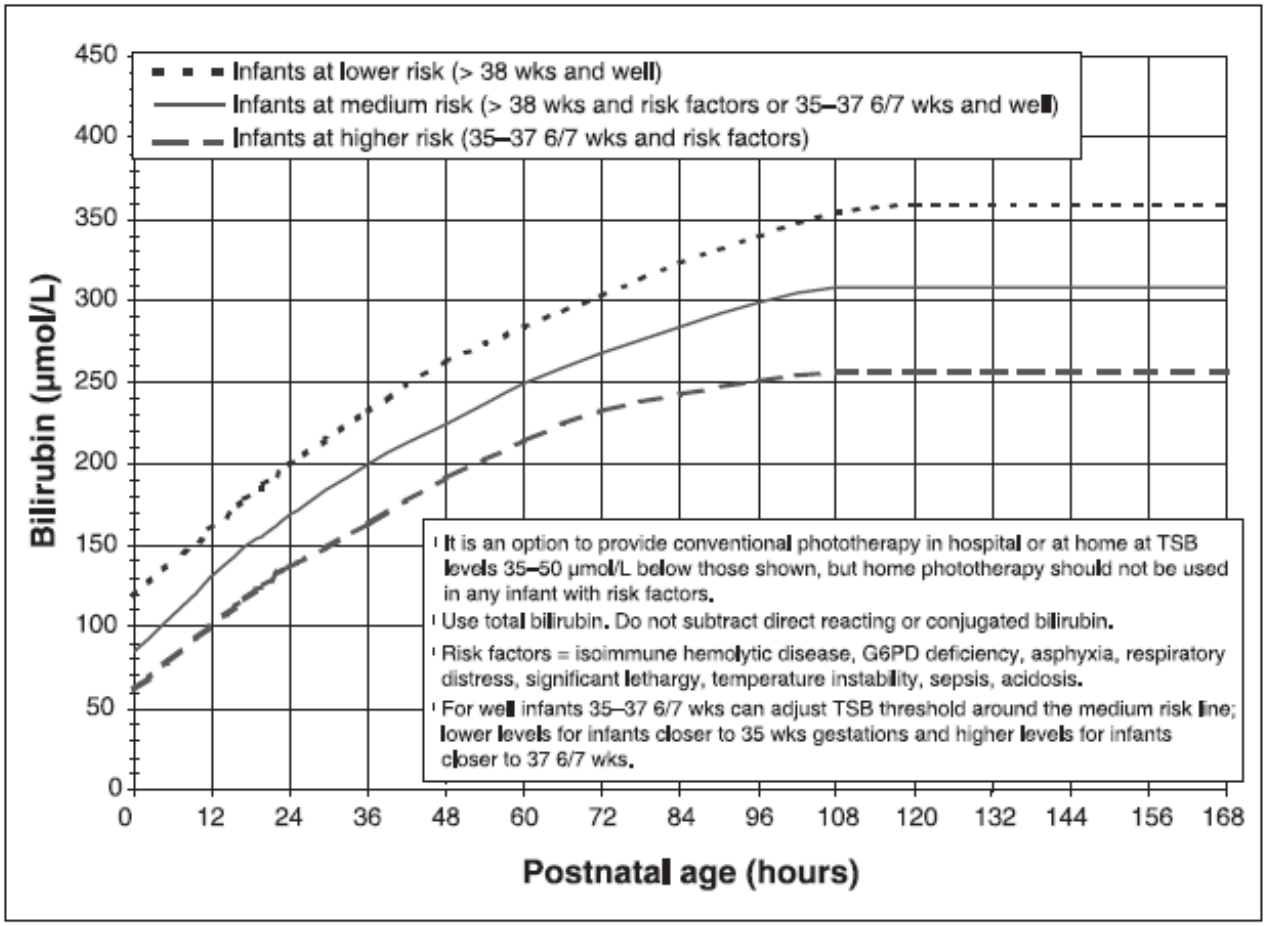
CATEGORY: Program Specific

SUBJECT: **HYPERBILIRUBINEMIA (JAUNDICE) ASSESSMENT AND MANAGEMENT**

APPENDIX B

Guidelines for Initiation of Phototherapy of Infants 35 Weeks or More Gestation

1. Identify the risk level based on gestational age risk factors and if the newborn is well.
2. Plot the newborn TSB result according to age of infant in hours at the time of TSB draw (include the date and time of the test). Place the nomogram in the newborn's chart under the Care Trends tab.
3. Notify the MRP of the result.
4. Obtain orders for repeat blood work and initation of phototherapy as required.
5. Subsequent results will be plotted on the nomogram and will be placed in the patient's record.



CATEGORY: Program Specific

SUBJECT: **HYPERBILIRUBINEMIA (JAUNDICE) ASSESSMENT AND MANAGEMENT**

APPENDIX C

SickKids

Phototherapy and Exchange Transfusion Guidelines for Preterm Infants < 35 Weeks Gestational Age

Use total bilirubin (add conjugated and unconjugated bilirubin). If conjugated bilirubin is > 50% of total serum bilirubin, consult staff physician to determine levels for therapy.

PHOTOTHERAPY INITIATION LEVELS
Total serum bilirubin (TSB) (micromol/litre)

- For infants > 1000 grams use INTENSIVE phototherapy (irradiance ~30µW/cm2/nm)
- For infants ≤ 1000 grams use STANDARD phototherapy (irradiance ~10µW/cm2/nm) unless TSB is rapidly rising or TSB continues to rise while receiving phototherapy (less irradiance used to reduce risk of oxidative tissue injury by phototherapy in extremely immature infants)

Post Menstrual Age (weeks)	Age in Hours	<24 hours	24-48 hours	49-72 hours	> 72 hours
	<28 0/7 and at risk*	70	80	80	90
	<28 0/7	80	90	90	100
	28 0/7 to 29 6/7 and at risk*	80	90	90	100
	28 0/7 to 29 6/7	90	100	120	140
	30 0/7 to 31 6/7 and at risk*	90	100	120	140
	30 0/7 to 31 6/7	100	120	140	170
	32 0/7 to 33 6/7 and at risk*	100	120	140	170
	32 0/7 to 33 6/7	100	130	170	200
	34 0/7 to 34 6/7 and at risk*	110	140	170	200
	34 0/7 to 34 6/7	110	160	210	230

EXCHANGE TRANSFUSION LEVELS
Total serum bilirubin (TSB) (micromol/litre)

- Exchange transfusion is recommended for infants whose TSB levels continue to rise to exchange levels despite receiving intensive phototherapy to the maximal surface area
- Exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonos, high-pitched cry); even if below exchange levels (but note that these signs can be subtle in very low birth weight infants and may be difficult to detect)

Post Menstrual Age (weeks)	Age in Hours	<24 hours	24-48 hours	49-72 hours	> 72 hours
	<28 0/7 and at risk*	190	190	210	220
	<28 0/7	190	200	210	240
	28 0/7 to 29 6/7 and at risk*	200	200	210	220
	28 0/7 to 29 6/7	200	210	220	240
	30 0/7 to 31 6/7 and at risk*	220	220	230	260
	30 0/7 to 31 6/7	220	230	260	270
	32 0/7 to 33 6/7 and at risk*	240	240	260	300
	32 0/7 to 33 6/7	240	250	290	300
	34 0/7 to 34 6/7 and at risk*	250	260	290	310
	34 0/7 to 34 6/7	260	270	310	320

***INFANTS AT GREATER RISK for BILIRUBIN TOXICITY**

Risk factors for bilirubin toxicity include:

- serum albumin level < 25 g/L
- rapidly rising TSB levels, greater than 8.5 micromol/litre/hour suggesting haemolytic disease
- clinically unstable infants*

***Clinically unstable infants:**
if one or more of the following in the preceding 24 hours:

- blood pH < 7.15
- blood culture positive sepsis
- apnea and bradycardia requiring cardio-respiratory resuscitation (bagging and/or intubation)
- hypotension requiring pressor treatment
- mechanical ventilation at time of blood sampling

Providing and Discontinuing Phototherapy

- The purpose of phototherapy is to prevent the need for exchange transfusion
- With phototherapy, the serum bilirubin should decrease by ~20-35 micromol/litre in 4-6 hours
- **Use postmenstrual age for phototherapy:** i.e. when a 29 0/7 week infant is 7 days old, use the TSB level for a 30 0/7 weeks
- **Discontinuing phototherapy:** discontinue phototherapy when the TSB is 20-35 micromol/litre below the initiation level. Check TSB 6-12 hours after discontinuing phototherapy to assess for rebound.

Rationale for Levels

- See reverse for references
- Treatment thresholds are based on published expert opinion that utilized best available, but limited data

Rationale for Levels (continued)

- Phototherapy levels in the first 24 hours of age were adapted from National Institute for Health and Clinical Excellence (NICE) United Kingdom (U.K.) guidelines
- Phototherapy levels between 24 and 72 hours of age were adapted from a combination of NICE guidelines and Maisels et al (2012) guidelines
- Exchange levels before 72 hours of age were adapted from Maisels et al (2012) guidelines
- Phototherapy and exchange levels beyond 72 hours of age, (EXCEPT for GA 34 weeks): levels were adapted from Maisels et al (2012) guidelines as these treatment thresholds are lower than NICE guidelines.
- Phototherapy and exchange levels beyond 72 hours, for gestational age (GA) 34 weeks: levels were adapted to align with AAP/CPS levels for GA ≥35 weeks

NOTE: HSN does not have equipment that provides standard phototherapy irradiance ~10µW/cm2/nm

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APPENDIX D

Treatment and Monitoring of Hyperbilirubinemia

Phototherapy	Instructions for Use
Biliblanket **Irradiance level: 35 µW/cm^2/nm**	1. Obtain the biliblanket from the NICU. 2. Place the unit on a solid surface (i.e. not in the cot or on top of the isolette). 3. Plug it in. Ensure nothing is covering the fans on the unit. 4. Place a disposable cover on the light pad. 5. Ensure the circled letters are facing down and the newborn is laying on the brightest side of the pad. 6. Cover the newborn's eyes with disposable goggles. 7. Clothe the newborn in a diaper only. The newborn may be swaddled with a pad.
Phototherapy Lamp **Irradiance level: 45 µW/cm^2/nm (both white and blue spotlights)**	1. Obtain the isolette with the attached phototherapy lamp from the NICU. If unavailable, obtain a portable phototherapy lamp and isolette from the NICU. 2. Undress the infant, leaving just the diaper on. 3. Apply eye protection to the infant. 4. Position the spotlight over the infant's torso at a distance of 38 cm, measured from the mattress. 5. Turn the light on. 6. **Birthing Center Only:** Monitor TPR Q1H x 2 then Q4H if stable. 7. Notify the MRP of any abnormal assessments. **NOTE:** • When the spotlight is placed as close to the incubator hood as possible, it will achieve the proper distance. If necessary, use the Allen key to adjust the position of the light on the side of the isolette. • The distance of 38 cm provides the proper irradiance (light intensity) for phototherapy treatment. If the light is raised higher, it will cover a greater surface area but it will decrease the irradiance output and, therefore, decrease the effectiveness of the phototherapy treatment. • **The phototherapy light should always be turned off when drawing a TSB. The light can then be turned back on until a result is received or until otherwise ordered.**
Intake and Output	• Ensure the infant is feeding a minimum of every 3-4 hours if they do not have an ordered Total Fluid Intake. • In the NICU, ensure the infant is meeting the minimum routine Total Fluid Intake per day as ordered by the physician. • Ensure adequate voiding and stooling is maintained by the newborn. Notify the MRP of any concerns.
Safety	• Check the infant frequently to ensure that the eye shields are protecting their eyes during spotlight treatment. Remove the eye protection when the infant is in bed or not under the lights. • Ensure temperature stability while the infant is in the isolette. The infant should be on Air Control mode. Refer to the *Thermoregulation Protocol – NICU* standard of care for approximate temperature settings.