1.0 PURPOSE AND INTENT:

1.1 To promote optimal assessment, diagnosis, management and follow-up of the newborn with the potential for and or hyperbilirubinemia.

1.2 To provide a rapid non-invasive method of obtaining neonatal bilirubin levels.

Note: All recommendations are approximate guidelines only and practitioners must take in to account individual patient characteristics and situation. Concerns regarding appropriate treatment must be discussed with the attending neonatologist.

2.0 PRACTICE OUTCOME:

2.1 Approximately 60% of normal newborns become clinically jaundiced in the first week of life. While the majority of these newborns have physiologic jaundice, vigilant assessment and follow-up is important to prevent severe hyperbilirubinemia and kernicterus. The Canadian Paediatric Society recommends universal screening for hyperbilirubinemia for all newborns in the early post birth period.

3.0 DEFINITIONS

3.1 Hyperbilirubinemia in the newborn: Excess serum bilirubin in the newborn due either to overproduction of bilirubin, as in excessive destruction of erythrocytes, or to reduction in glucuronide conjugation in the liver. If a high level of bilirubinemia is left untreated, kernicterus may occur as a result of free unconjugated bilirubin entering the brain tissue and causing neurotoxic damage.

3.2 Standard Phototherapy: Light therapy with a single light source that can deliver a minimum of 30 µW/cm²/nm (see Appendix E or information provided by light manufacturer). (Note: In the current Canadian Paediatric Society (CPS) guidelines this is referred to as intensive phototherapy.)

3.3 Intensive Phototherapy: Light therapy that covers a minimum of 80% of the infant’s skin surface area using one or more light sources that can deliver a minimum of 30 µW/cm²/nm. This usually requires two light sources.

3.4 Transcutaneous bilirubin (TcB) meter: a hand held meter that provides an estimate of circulating bilirubin obtained by making calculations which measure the difference between bilirubin in the skin and subcutaneous tissue and minimizes the impact of melanin (skin color) on the transcutaneous assessment. The result is expressed as the “TcB” The measurement range is 0 to 340 µmol/L. An average of three measurements are used. For meter operation see the Standard Operating Procedures for Draeger Jaundice Meter.

3.5 Total Serum Bilirubin (TSB): Total amount of bilirubin in the blood determined by sending a blood sample to the laboratory.

4.0 GUIDELINES:

Universal Screening of All Newborns

4.1 Screen all newborns of any gestational age who have not received phototherapy or an exchange transfusion for the development of hyperbilirubinemia using the TcB monitor, after 24 hours of age and
every 24 hours thereafter until discharged from hospital. If admitted to a neonatal unit, continue for the first 7 days unless otherwise ordered by infant’s prescribing practitioner. Newborns in neonatal areas may have testing done earlier than 24 hours of age in order to screen for pathologic jaundice.

4.2 Use infant’s forehead as primary site for TcB reading unless extensively bruised and discolored; use infant’s sternum as secondary site if required.

4.3 If TcB reading appears inconsistent with clinical assessment, use clinical judgment to order TSB and/or request care provider assessment.

4.4 When the TcB meter display shows ‘_ _ _’, the estimated bilirubin exceeds 340 μmol/L. Record such results as > 340 and notify care provider immediately for direction related to TSB and/or phototherapy.

4.5 For infants 35 weeks Gestational age or more plot TcB reading plus 25 μmol/L on the Nomogram for designation of risk based on hour specific serum bilirubin value (Appendix B or found at website: http://bilitool.org/). Determine next steps based on the zone as follows:

- High risk zone: Notify infant care provider. Do TSB immediately and repeat TSB in 24 hours.
- High Intermediate risk zone: Term infants - Repeat TcB in 24 hours while in hospital or do a TSB prior to discharge if going home. For all preterm infants <38 weeks - do TSB.
- Low Risk zone: no follow-up required post discharge.

4.6 For infants less than 35 weeks gestational age, plot the TcB result on the graph in Appendix D specific to their birthweight. If the value plots in the phototherapy range, inform care provider to obtain an order for a TSB. (Note: An additional 25 does NOT have to be added when plotting on these graphs).

4.7 Make decisions regarding neonatal bilirubin therapy (phototherapy, exchange transfusion) only on TSB results. Note: If TcB level is close to treatment / phototherapy levels, a TSB is required.

Assessment and Management

4.8 If breastfeeding, assist mothers to breastfeed at least 8 times per day. If extra fluids are required for dehydration or weight loss, expressed breast milk or infant formula should be given as outlined in the WRHA Breastfeeding Guidelines for the Health Term Infant.

4.8.1 Provide intravenous fluid supplementation to infants under phototherapy who are approaching Total Serum Bilirubin (TSB) exchange transfusion levels. (see Appendix C for Phototherapy Implementation Threshold Graphs. and Appendix D for TSB Exchange Transfusion levels graph) Continue breastfeeding. Consult Breastfeeding Service if required.

4.9 Visually assess the newborn for clinical features of jaundice by blanching the infant’s skin with a thumb to determine the degree of yellow discoloration that is present after the pressure is released. Inspect palms and soles of feet, oral mucosa and conjunctiva. Note: Since visual assessment in a non-Caucasian infant can be difficult, a second opinion may be required. If jaundice is seen prior to 24 hours of age then TcB should be done earlier.

4.10 For infant born at 35+ weeks gestation, initiate the following investigations if TSB levels reach phototherapy levels as identified using the chart in Appendix C:

- Total and direct bilirubin
- Consider CBC, reticulocyte count and peripheral smear
- Consider ABO/Rh antibody screen and direct antiglobulin test (DAT, type and screen) if poor response to phototherapy or if the maternal blood type is Rh negative or ABO group O.
- G6PD level if suggested by ethnic or geographic origin, or poor response to phototherapy.

4.11 For infants of all gestational ages, initiate standard phototherapy on physician’s order when the infant’s TSB reaches the threshold based on the charts in Appendix C. Please note that in the Canadian Paediatric Society guidelines as well as the Appendix C, intensive phototherapy is
equivalent to standard phototherapy as defined in this practice guideline. Once treated with phototherapy, TcB is no longer accurate and all further assessments must be serum samples.

4.12 Consider consultation to Neonatology in infants who:
- Fail to respond to standard phototherapy (bilirubin continues to rise or does not decrease)
- Are approaching exchange transfusion levels as per Appendix C (there is no chart in the Newborn Exchange transfusion guidelines)
- Have a documented bilirubin level greater than 400umol/l
These infants may require intensive phototherapy which can only be provided in the IMCN or NICU at this time.

4.13 As ordered by the primary care provider, monitor TSB levels at least once daily until they remain below phototherapy levels after phototherapy has been discontinued. Anticipate an approximate 10% rebound after discontinuation of phototherapy. If the levels while on phototherapy do not drop or continue to rise, consider need for consult to Neonatology for intensive phototherapy utilizing 2 light sources or exchange transfusion based on the indications and TSB levels as outlined in the practice guideline 80.275.404: Newborn Exchange Transfusion.

4.14 Consider intravenous immune globulin (IVIG) administration to reduce need for exchange transfusions in infants with Rh, ABO and other iso-immunization conditions. Administer IVIG to these infants if the bilirubin is rising despite intensive phototherapy or is within 34 to 51µmol/L of exchange transfusion level. Refer to IVIG drug monograph in Pediatric Parenteral Drug Manual. These infants need to be cared for in the Special care units.

Discharge Planning For Newborns Not Admitted to Neonatal Areas

4.15 Plot the most recent pre-discharge TcB and/or TSB level on nomogram to determine risk for hyperbilirubinemia after discharge. (See Appendix B). During discharge planning, discuss infant jaundice with infant’s primary care provider and prepare a follow up plan for all infants with any risk factor(s) for hyperbilirubinemia (see Appendix A). For those in the high risk category arrange TSB within 24 hours after discharge.

4.16 Obtain consent for public health nurse contact and communicate plan with public health nurse on the Postpartum Referral Form and/or Infant Referral Form form. Plan may include further assessment of jaundice level, repeat TcB or TSB level, or follow-up with a health care provider at 24-hour intervals where bilirubin testing is available. If follow up is not available, discharge may be delayed.

4.16.1 Include the following information on the form:
- Most recent TcB / TSB, as requested on the form
- Risk zone as per nomogram
- Follow up arrangements as required
- Need for early follow-up / priority visit for late preterm infants with a note: “Late preterm infant – at risk for jaundice”.

4.17 Provide all parents/infant caregivers with information on jaundice and review it with them before discharge. (Information in “Caring for yourself and baby after giving birth”).

Readmission

4.18 For infants with hyperbilirubinemia who are at home, re-admit to hospital if not eligible for Home Phototherapy. Refer to WRHA Community Home Phototherapy Guidelines for information on jaundice management in the community. Begin phototherapy as soon as possible while waiting to transfer to in-patient unit and follow the guidelines as outlined above.

4.19 Utilize a bassinet as it is the most appropriate sleeping surface for the newborn who is less than 4 weeks of age. This surface promotes a sense of normalcy for the mother and helps to minimize the negative impact of hospitalization on breastfeeding and bonding. Provide an appropriate bed for the mother who is still recovering from the delivery.
4.20 At re-admission, if TSB is approaching or at exchange transfusion level, reassess TSB every 4 hours and consider exchange transfusion if the level does not fall over 4 hours of maximized intensive phototherapy. At the time of presentation, send blood to Canadian Blood Services (CBS) for a group and match (or type and screen and crossmatch) for exchange transfusion blood. Phone CBS to alert them of the potential need.

Discharge Planning From Children’s Hospital

4.21 Provide family with discharge instruction sheet and instruct them to make a follow-up appointment with community pediatrician or family physician.

4.22 Obtain consent for public health nurse contact then fax discharge instruction sheet to Public Health Central Office. The appropriate public health nurse will then be notified of patients’ discharge from hospital and will arrange a follow-up home visit.

Providing Phototherapy

4.23 Standard Phototherapy:

Exposing as much of the baby’s skin and buttocks to the light as possible (lying on diaper if under radiant warmer, very low slung diaper if not). Provide continuous phototherapy even during provision of care until there is a documented decrease in bilirubin level. Once a decrease in bilirubin level has occurred, interrupt phototherapy for care provision only for brief periods of time. Provide standard phototherapy using one of the following methods:

4.23.1 A fibre-optic blanket that provides at least 30 µW/cm2/nm wrapped completely around the infant’s torso to ensure that maximum amount of skin is exposed to the light. Ensure that the heavy part of the device is not on top of the baby.

4.23.2 An overhead spot light, ensuring that the appropriate distance is maintained between the light and the skin. Spot light phototherapy (i.e. Giraffe SpotLite) is used predominantly for preterm infants; the most effective distance between the infant and the spot light is 15 inches. Remove infant positioning aids to maximize skin exposure.

4.23.3 Note: These methods provide more effective phototherapy than previous methods referred to as ‘single’ phototherapy and should be the starting point when phototherapy is indicated. Phototherapy Bed (Medela Bilibed) does not permit the provision of continuous phototherapy during feedings.

4.24 Intensive phototherapy:

4.24.1 Aim to expose 80% of the skin surface to light. Use both a phototherapy blanket or phototherapy bed under the infant and one overhead light above, maximizing the effectiveness of each as outlined above. Each light source must be able to deliver a minimum of 30 µW/cm2/nm. More than 2 phototherapy light sources do not provide additional benefit. If using a light source that has multiple settings (such as the Biliblanket Plus), ensure that it is set at maximum (see Appendix E).

Note: This method provides equivalent or more effective phototherapy than previous methods referred to as ‘double’ phototherapy.

4.25 When using overhead lights keep eyes covered with appropriate sized eye covers at all times. When using fibre-optic light sources that allow the infant to be dressed and/or bundled, cover the eyes whenever the infant is not under direct observation (either being held or in the infant bed with adult sitting close by) as eyes may inadvertently be exposed to light. See Appendix E for demonstration of how to wrap a baby in the fibre-optic blanket for maximum phototherapy.

4.26 Avoid using oil based topical preparations (medicinal ointments, petroleum jelly) on areas of skin exposed to phototherapy. Preparations used on the diaper area if a diaper is worn during phototherapy is acceptable.

4.27 Oxygen saturation measurements can be hindered by phototherapy. If an oximeter is not consistently picking up readings cover the sat probe with a cloth to see if this remedies the problem.
5.0 DOCUMENTATION

5.1 Record the date, time and TcB or TSB reading in μmol/L, initiation and discontinuation of phototherapy on the newborn care map or infant data record. When documenting TcB result, do NOT add an additional 25. Record the number from the TcB meter.

5.2 Document assessment and actions in Integrated Progress Notes as necessary.

5.3 Document the discharge TcB and/or TSB date, time, results and corresponding “Risk Zone” on Postpartum Referral Form for information and follow-up by Public Health as required.

6.0 REFERENCES:


6.5 Canadian Pediatric Society (2011). Guidelines for detection, management and prevention of hyperbilirubinemia in term and late preterm newborn infants (35 or more weeks’ gestation) POSITION STATEMENT (FN 2007-02). Paediatrics and Child Health. 12 Suppl B. 1B-12B.


6.9 Fozzas, S., Mantogou, L., Skylogianni, E. et al. (2012). Transcutaneous bilirubin levels for the first 120 postnatal hours in healthy neonates. Pediatrics, 125(1). E52-e57. DOI: 10.1542/peds.200-0403


7.0 PRIMARY AUTHORS:

7.1 Nurse Educators, Child Health, Medicine & Neonatology, Women’s Health

7.2 Neonatal Intensive Care Unit & Intermediate Care Nursery Assistant Medical Directors

7.4 Clinical Nurse Specialists, Neonatology & Women’s Health (HSC & SBH)
APPENDIX A
Risk Factors for Development of Severe Hyperbilirubinemia in Infants of 35 or More Weeks’ Gestation
(Approximate Order of Importance)

Major risk factors
- Predischarge TSB or TcB level in the high-risk zone on nomogram
- Jaundice observed in the first 24 hours after birth
- Blood group incompatibility with positive direct antiglobulin test (DAT), or other known hemolytic disease such as G6PD deficiency
- Gestational age 35-36 weeks
- Previous sibling received phototherapy
- Cephalohematoma or significant bruising
- Exclusive breastfeeding, if nursing is not going well and weight loss is excessive (dehydration)
- East Asian race (as defined by mother’s description)
- Sepsis
- Asphyxia
- Respiratory distress
- Significant lethargy
- Temperature instability
- Acidosis

Minor risk factors
- Predischarge TSB or TcB level in the high-intermediate risk zone on nomogram
- Gestational age 37-38 weeks
- Jaundice observed before discharge from hospital
- Previous sibling with jaundice
- Macrosomic infant of a diabetic mother
- Intra-uterine growth restricted (IUGR) for gestational age infant

Screening Jaundice Risk
- J – Jaundice is visible within the first 24 hours
- A - Age (gestation) less than 38 weeks and/or a sibling had jaundice as a neonate
- U - Unrecognized hemolysis
- N - Non-optimal feeding, exclusive breastfeeding with weight loss
- D - Deficiency of glucose-6-phosphate dehydrogenase (G6PD)
- I - Infection, Infant of a Diabetic Mother
- C - Cephalohematoma / bruising or central hematocrit greater than .0.65L/L
- E – Ethnicity - East Asian, Mediterranean or Aboriginal
APPENDIX B
Nomogram for designation of risk based on hour-specific serum or transcutaneous bilirubin value

Note: When plotting value from TcB, add 25 on this nomogram only.

**Note:** If TcB or TSB value plots on line between risk zones, follow directions for follow up as per higher risk zone.
APPENDIX C
Phototherapy Implementation Threshold Graphs

For Gestational Age 35+ Weeks:

Reproduced and adapted with permission from Pediatrics 2004;114:297-316. (©) 2004 by the American Academy of Pediatrics.
APPENDIX D
Phototherapy Implementation Threshold Graphs
For Gestational Ages 34 weeks, 6 days or less:

Birthweight 2001 - 2500 g

Birthweight 1500 - 2000 g

Birthweight < 1500 g
Birthweight < 1000 g (black zone)

2-4 Adapted from Cockinton, R.A.
"A guide to the use of phototherapy in the management of neonatal hyperbilirubinemia."
Figure 3) Guidelines for exchange transfusion in infants of 35 or more weeks’ (wk) gestation. These guidelines are based on limited evidence and the levels shown are approximations. Exchange transfusions should be used when the total serum bilirubin (TSB) concentration exceeds the line indicated for each category. G6PD Glucose-6-phosphate dehydrogenase
APPENDIX E

Phototherapy Unit Light Ratings

Phototherapy bed:
Medela Bilibed Phototherapy*: 30 µW/cm²/nm

Phototherapy Blanket:
Ohmeda Biliblanket Plus*: 33.75 – 56.25 µW/cm²/nm (setting can be dialed up or down)

Ohmeda Bilisoft biliblanket (with cover)**: Small pad 50 µW/cm²/nm; Large pad 35 µW/cm²/nm

Spot light phototherapy:
Ohmeda Giraffe Spot PT lite**: 30-40 µW/cm²/nm when source 15 inches above infant (This spot light can only be utilize in the preterm infants admitted to NICU/IMCN).

NOTE: The following phototherapy units do not provide adequate amounts of phototherapy and should not be used. They are being removed from service in the Health Sciences Centre: Air-Shields Vickers Phototherapy bank of overhead lights*: Average 13-14 microwatts, minimum 10 µW/cm²/nm and Drager Babytherm*: 10 µW/cm²/nm

Source:
*Biomedical Engineering Department, St. Boniface Hospital
**Manufacturer’s specifications
For access to phototherapy units on the wards at Children’s Hospital contact CH5 unit desk.