



# CLINICAL PATHWAY MANUAL *for* Midwifery Hyperbilirubinemia Screening and Management of Phototherapy

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## PURPOSE

This clinical pathway has been developed to provide midwives with guidance on screening and phototherapy management for hyperbilirubinemia in infants in their care. It is meant to be used in conjunction with the Association of Ontario Midwives' (AOM) clinical practice guideline (CPG) [No. 18: Management of Hyperbilirubinemia in Healthy Term and Late Preterm Neonates](#). The CPG contains pertinent information that contextualizes the guidance in this pathway. Midwives should familiarize themselves with the CPG to ensure a full understanding of the guidance herein and its appropriate application. As with the AOM's clinical practice guidelines, the information in this clinical pathway manual is not intended to dictate a course of action, but is meant to be used as a tool to assist midwives with clinical decision-making.

Midwives should consider this clinical pathway in relation to their scope of practice, midwifery standards, available resources and the communities within which they practice. This clinical pathway should not replace professional skill and judgment. Midwives should use their clinical judgment when interpreting and applying this clinical pathway to individual client and practice circumstances.

## DEVELOPMENT OF THIS CLINICAL PATHWAY

This clinical pathway has been adapted for midwives from the [Clinical Pathway Handbook for Hyperbilirubinemia in Term and Late Pre-Term Infants \( \$\geq 35\$  weeks\)](#) from the Provincial Council for Maternal and Child Health (PCMCH) and Ontario's Ministry of Health (MOH). The AOM has adapted key aspects (the care pathway algorithm and instructions) of the PCMCH clinical pathway handbook for hyperbilirubinemia to incorporate midwifery philosophy and model of care, and to reflect guidance in the AOM's clinical practice guideline No. 18: Management of Hyperbilirubinemia in Healthy Term and Late Preterm Neonates. The PCMCH Hour Specific Nomogram and Follow-Up Algorithm are used in this midwifery clinical pathway and remain unchanged (see [Table 1](#) in the Appendix for further details).

## KEY OBJECTIVES

The key objectives of this clinical pathway are to:

- Provide midwives with a clinical pathway for hyperbilirubinemia screening, following recommendations from the AOM's clinical practice guideline No. 18: Management of Hyperbilirubinemia in Healthy Term and Late Preterm Neonates.
- Provide midwives with a clinical pathway for midwifery management of phototherapy, if applicable to the individual midwife's practice.

## POPULATION DEFINITION

This clinical pathway for midwifery screening and management of phototherapy is intended for:

- healthy newborns born within midwifery care; and
- infants born  $\geq 35$  weeks.

Midwives should consult with a physician if any of the following are encountered, as this clinical pathway is not applicable to:

- infants who are  $< 35$  weeks' gestation;
- infants who develop visible jaundice  $< 24$  hours;
  - » Newborns for whom jaundice is visible within the first 24 hours are at an increased risk of developing severe hyperbilirubinemia.
- infants born to a birthing parent known to have red cell antibodies (isoimmunization) during the prenatal or intrapartum period;
  - » For the birthing parent who is isoimmunized, a pediatric consultation for the infant is warranted due to the increased risk of bilirubin encephalopathy.
- infants who are unwell.

Midwives should consult with a physician when any of the following are encountered and phototherapy is required:

- infants who have lost more than 10% of their birth weight,
- infants between 35 + 0 to 36 + 6 weeks' gestation, or
- infants who test positive for direct Coombs/direct anti-globulin test (DAT).

## SCREENING – SPECIAL CONSIDERATIONS

### Type O birthing parents

One common underlying condition that can cause or worsen the severity of neonatal hyperbilirubinemia is hemolytic disease of the newborn (HDN) because of an ABO blood group incompatibility. Most commonly, this is the result of a group O birthing parent giving birth to an infant who is group A or B. O blood type is very common: about 46% of people in Canada have this blood type. A direct anti-globulin test (DAT), also referred to as a direct Coombs test, can be done on an infant's cord blood or blood drawn by heel prick to identify the presence of parental antibodies.

#### *Special considerations: type O birthing parents*

For type O birthing parents, midwives should consider drawing cord blood and storing it for processing, in the event that jaundice presents in the first 24 hours or that a total serum bilirubin (TSB) is later drawn for that infant. Having information about an infant's blood group and DAT may facilitate risk assessment for hemolysis and identify infants at greater risk of developing severe hyperbilirubinemia.

When a TSB is drawn for infants of type O birthing parents, midwives may order blood group and DAT:

- i. on cord blood stored from birth, or
- ii. by drawing a tube of blood in addition to TSB (by heel prick).

At the lab, if the newborn's TSB level is normal (i.e., below treatment threshold) and no further testing or treatment is required, cord blood will not need to be tested for isoimmunization.

If the TSB level is high, cord blood will be processed by the lab to aid in identifying the cause of hyperbilirubinemia and to determine the need for follow-up.

## TRANSCUTANEOUS BILIMETRES (TcB) AND TSB

### *Special considerations: use of TcB*

- For screening purposes, TcB should be used preferentially over TSB blood draws (if available), as it is a painless, less invasive intervention that offers point of care testing, reduces the requirement for unnecessary travel by the client and the midwife, and keeps care within the community.
- TcB tends to overestimate bilirubin levels in infants with darker skin tones; however, use of bilimetres is still appropriate for darker-skinned infants.
- TcB has good correlation with TSB but is less accurate at higher bilirubin concentrations. Therefore, if TcB is **within 50 µmol/L of, at or above** the exchange transfusion threshold or phototherapy treatment line, a TSB should be taken.
  - » If TSB value is **at or above** the phototherapy treatment line, this result can be used as the baseline reading for phototherapy management.
  - » Midwives should use their clinical judgment to determine whether they will initiate phototherapy before the TSB result becomes available. In making this decision, midwives should take into account the TcB measurement's proximity to the phototherapy treatment line, the newborn's general well-being, gestational age, the presence of any risk factors and timing considerations for availability of the TSB result.
- TcB should not be used during or after phototherapy to assess bilirubin levels.

## AOM BILITOOL APP

The AOM BiliTool App is a mobile application available to midwives that provides midwifery-specific hyperbilirubinemia screening, treatment and follow-up recommendations. Midwives can enter TSB and TcB measurements, in addition to other clinically meaningful data (such as an infant's weight and risk factors for hyperbilirubinemia), directly into the application.

If the TSB/TcB measurements meet the exchange transfusion and/or phototherapy treatment thresholds, the BiliTool App displays the appropriate recommendations.

The AOM BiliTool App facilitates the interpretation of bilirubin levels and may be used in conjunction with this care pathway for screening purposes. However, midwives can still interpret these results by manually plotting onto the exchange transfusion (Figure 1) and phototherapy treatment graphs (Figure 2).

### *Special considerations: AOM BiliTool App*

- If TcB is **within 50 µmol/L** of the phototherapy treatment threshold, the application prompts the midwife to obtain a TSB measurement.
- If TcB is **at or above** the phototherapy treatment threshold, the application prompts the initiation of phototherapy.
- If TcB is **within 50 µmol/L** of the exchange transfusion treatment threshold, the application prompts the midwife to consult with a physician.

# CLINICAL PATHWAY FOR MIDWIFERY HYPERBILIRUBINEMIA SCREENING AND MANAGEMENT OF PHOTOTHERAPY

## This clinical pathway does not apply in the following circumstances:

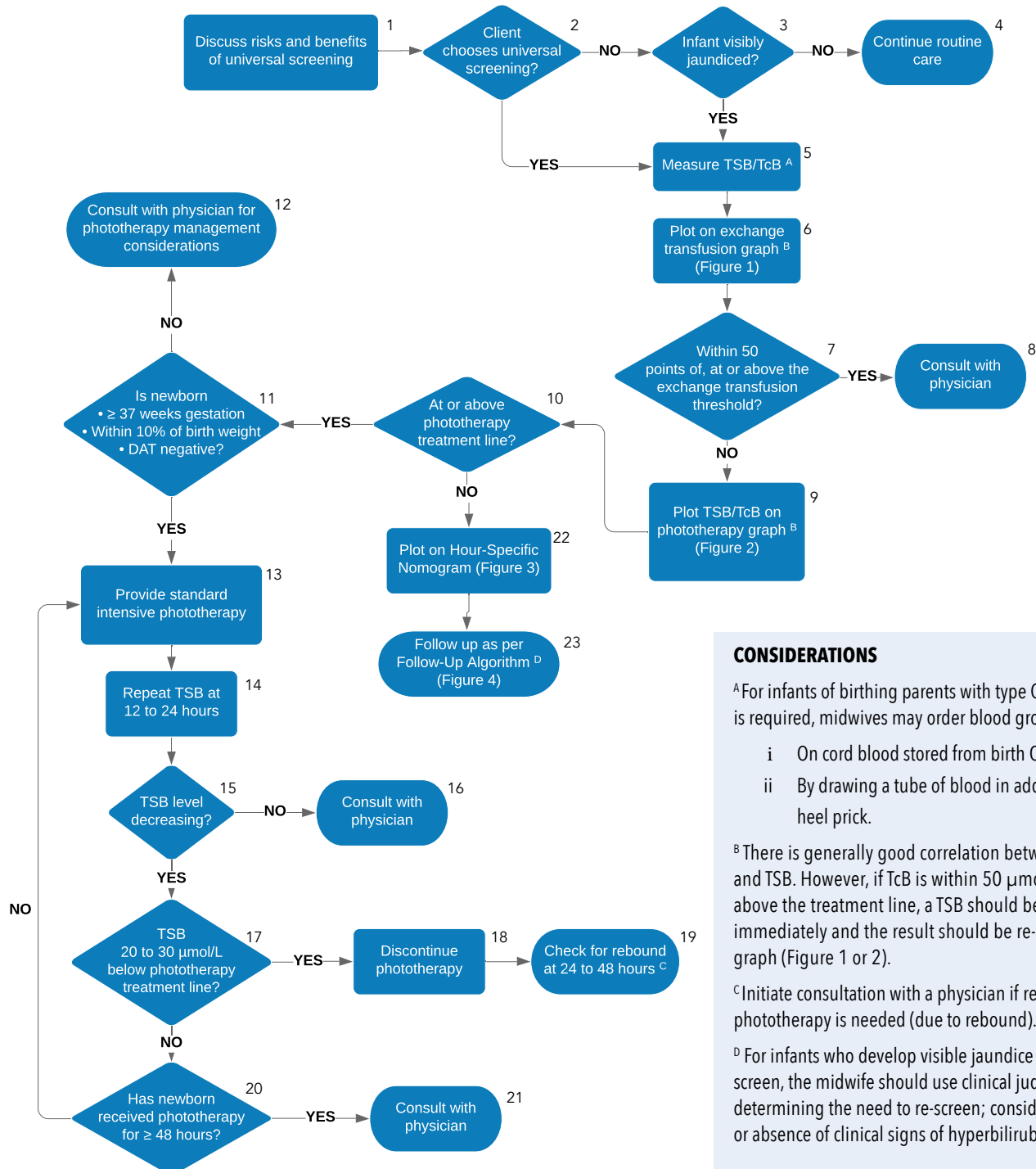
- Infants who are < 35 weeks' gestation
- Infants with visible jaundice < 24 hours
- When isoimmunization has been identified in the birthing parent during the prenatal or intrapartum period
- Infants who are unwell

*For any of these criteria, consultation with a physician is warranted.*

TSB = Total Serum Bilirubin (unconjugated/indirect bilirubin + conjugated/direct bilirubin)

TcB = Transcutaneous Bilirubin

DAT = Direct Anti-Globulin Test (i.e., Coombs)



## CONSIDERATIONS

<sup>A</sup> For infants of birthing parents with type O blood. If a TSB is required, midwives may order blood group and DAT:

- On cord blood stored from birth OR
- By drawing a tube of blood in addition to TSB by heel prick.

<sup>B</sup> There is generally good correlation between TcB and TSB. However, if TcB is within 50 µmol/L of, at or above the treatment line, a TSB should be performed immediately and the result should be re-plotted on the graph (Figure 1 or 2).

<sup>C</sup> Initiate consultation with a physician if repeat phototherapy is needed (due to rebound).

<sup>D</sup> For infants who develop visible jaundice after initial screen, the midwife should use clinical judgement in determining the need to re-screen; consider the presence or absence of clinical signs of hyperbilirubinemia.

# CLINICAL PATHWAY INSTRUCTIONS AND SPECIAL CONSIDERATIONS

STEP	INSTRUCTIONS
<b>SCREENING</b>	
1	<p>Discuss the risks and benefits of universal screening with all clients as part of an informed choice discussion. This discussion may address:</p> <ul style="list-style-type: none"> <li>• what is known about risk factors, if present;</li> <li>• how visible jaundice, poor feeding, dehydration and weight loss impact an infant's risk of developing severe hyperbilirubinemia;</li> <li>• what is known about the limitations of visual assessment for jaundice;</li> <li>• optimal timing of screening (between 24 and 72 hours after birth);</li> <li>• barriers to and facilitators of screening within the client's community context;</li> <li>• the client's values, preferences and risk tolerance.</li> </ul> <p>Following this discussion, the client will either choose a universal screening approach (screening within 24 to 72 hours after birth) or wait to see if the newborn develops visible jaundice. If visible jaundice develops, screening is recommended. (See AOM CPG No. 18 recommendations 1, 8, 11 and 12 for more information about screening and associated risk factors.)</p> <p>Inform parents to contact the midwife if their newborn appears visibly jaundiced in the first 24 hours after birth or develops other signs associated with severe hyperbilirubinemia (at any time), including:</p> <ul style="list-style-type: none"> <li>• poor suck and/or a reduction in feeding</li> <li>• lethargy</li> <li>• dark urine; pale, chalky stools</li> <li>• high-pitched cry</li> </ul> <p>Consult with a physician if visible jaundice is noted in infants &lt; 24 hours of age or if signs of severe hyperbilirubinemia develop.</p>
2	<p>Does the client choose universal screening?</p> <ul style="list-style-type: none"> <li>• If yes, skip to step 5</li> <li>• If no, skip to step 3</li> </ul>
3	<p>If the client does not choose universal screening, assess whether or not the newborn is visibly jaundiced.</p> <p>Signs of visible jaundice include:</p> <ul style="list-style-type: none"> <li>• skin and/or mucosal tissue that appears visibly yellow in lighter-skinned infants or when blanched in darker-skinned infants</li> <li>• yellow sclera</li> </ul> <p>Is the newborn visibly jaundiced?</p> <ul style="list-style-type: none"> <li>• If yes, skip to step 5</li> <li>• If no, skip to step 4</li> </ul>
4	<p>If the newborn is <b>not</b> visibly jaundiced, continue providing routine care.</p>
5	<p>Measure TSB or TcB.</p> <p>See <i>Special considerations: type O birthing parents</i></p>

STEP	INSTRUCTIONS
<b>TSB/TcB MEASUREMENT</b>	
<b>6</b>	<p>Plot TSB or TcB measurement on the exchange transfusion graph first, using age in hours at the time the bilirubin was taken (Figure 1).</p> <p>Plotting first on the exchange transfusion graph (Figure 1), rather than on the phototherapy graph (Figure 2), will quickly determine whether the infant's ongoing care should be managed by a physician or a midwife.</p> <p>Determination of the treatment line depends on gestational age at birth as well as the presence of risk factors found using Figure 1.</p> <p>See <i>Special considerations: use of TcB</i></p>
<b>7</b>	<p>Is the TSB or TcB value <b>within 50 µmol/L of, at, or above</b> the exchange transfusion treatment line/threshold on Figure 1?</p> <ul style="list-style-type: none"> <li>• If yes, skip to step 8</li> <li>• If no, skip to step 9</li> </ul>
<b>8</b>	<p>If the TSB or TcB value is <b>within 50 µmol/L of, at or above</b> the exchange transfusion threshold, consult with a physician and transfer care.</p>
<b>9</b>	<p>If TSB or TcB is <math>\geq 50 \mu\text{mol/L}</math> <b>below</b> (i.e., if TSB or TcB is <b>not</b> within <math>50 \mu\text{mol/L}</math>) the exchange transfusion threshold, plot value on the phototherapy graph (Figure 2).</p> <p>If TcB is <b>within 50 umol/L of, at, or above</b> the phototherapy treatment line, a TSB should be drawn promptly and replotted on the graph (Figure 2). If the initial reading from a TcB is above the phototherapy line, a TSB should be drawn for an accurate baseline before initiating phototherapy.</p> <p>Determination of the phototherapy treatment line depends on gestational age at birth, as well as the presence of risk factors found on Figure 2. Plot on phototherapy graph using TSB or TcB and age in hours at the time the bilirubin was drawn.</p> <p>See <i>Special considerations: use of TcB</i></p>
<b>10</b>	<p>Is the TSB value <b>at or above</b> the phototherapy treatment line/threshold on Figure 2?</p> <ul style="list-style-type: none"> <li>• If yes, proceed to step 11</li> <li>• If no, skip to step 22</li> </ul>

STEP	INSTRUCTIONS
<b>PHOTOTHERAPY MANAGEMENT</b>	
<b>11</b>	<p>Assess whether the newborn meets criteria for midwifery management of phototherapy.</p> <p>Is the newborn:</p> <ul style="list-style-type: none"> <li>• Term (<math>\geq 37</math> weeks') gestation?</li> <li>• Within 10% of their birth weight?</li> <li>• DAT negative?</li> </ul> <p>Does newborn meet these criteria?</p> <ul style="list-style-type: none"> <li>• If no, initiate consult with a physician (step 12)</li> <li>• If yes, skip to step 13</li> </ul>
<b>12</b>	<p>If the newborn does not meet criteria outlined in step 11, consult with a physician.</p> <p>* If following a consult with a physician the decision is made for the midwife to continue to manage phototherapy, the midwife may manage phototherapy according to the criteria agreed to by the physician and the midwife.</p>

STEP	INSTRUCTIONS
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## PHOTOTHERAPY MANAGEMENT, CONT.

**13** If the TSB value is **at or above** phototherapy threshold, commence standard intensive phototherapy (see instructions below):

**Conventional phototherapy**

- Ensure unit is set to the correct irradiance:
  - » 430 to 490 nm band, 30  $\mu\text{w}/\text{cm}^2/\text{nm}$  (standard intensive phototherapy).
- Diaper can remain on the newborn; expose maximum skin surface.
- Ensure newborn's eyes are protected from halogen or fluorescent lights.
- Use clinical judgment regarding interruptions to infant exposure to lights, considering timing and length of infant feeding or other required care (e.g., TSB level, presence of risk factors).  
The [Clinical Pathway Handbook for Hyperbilirubinemia in Term and Late Pre-Term Infants \( \$\geq 35\$  weeks\)](#) suggests limiting interruptions to 20 minutes every three hours.

**Fibre optic phototherapy**

- Ensure unit is set to the correct irradiance:
  - » 430 to 490 nm band, 30  $\mu\text{w}/\text{cm}^2/\text{nm}$  (standard intensive phototherapy).
- Ensure fibre optic blanket is in direct contact with skin; clothing may be worn over the blanket, if feasible.
- Diaper can remain on the newborn; expose maximum skin surface.
- Do not remove blanket from the newborn when feeding. Remind parents that they may also keep a blanket on the newborn when providing other routine care, such as during diaper changes.

**14** Repeat TSB measurement 12 to 24 hours after standard intensive phototherapy was initiated. Use clinical judgment to determine appropriate timing for this follow-up testing.

**15** Assess TSB level: is repeat TSB measurement lower than baseline TSB measurement?

- If no, proceed to step 16
- If yes, skip to step 17

**16** If TSB level has not decreased since initiation of phototherapy, consult with a physician immediately.

**17** If TSB level has decreased since initiation of phototherapy, is it at least **20 to 30  $\mu\text{mol/L}$  below** the phototherapy treatment threshold?

- If yes, proceed to step 18
- If no, skip to step 20

**18** If TSB level is at least **20 to 30  $\mu\text{mol/L}$  below** the phototherapy treatment threshold, discontinue phototherapy.  
If administering phototherapy in the hospital, the midwife may discharge the newborn at this point. Use clinical judgment to determine timing of discharge.

**19** Check for rebound (i.e., the TSB measurement indicates that phototherapy is required) 24 to 48 hours following the discontinuation of phototherapy using a TSB.

**20** Determine total length of time of the newborn's phototherapy since initiation. Has the newborn received phototherapy for  $\geq 48$  hours?

- If yes, proceed to step 21
- If no, return to step 13

**21** If the newborn requires phototherapy for  $\geq 48$  hours, consult with a physician.

STEP	INSTRUCTIONS
<b>FOLLOW-UP TESTING (FOR NEWBORNS WHO DO NOT REQUIRE PHOTOTHERAPY)</b>	
<b>22</b>	<p>If phototherapy is not required, plot TSB/TcB value on the Hour Specific Nomogram (Figure 3), which will assign the infant a risk zone (low, low-intermediate, high-intermediate or high) for follow-up.</p> <p>Determine infant risk zone, and assess whether the infant has any risk factors for severe hyperbilirubinemia (see Table 2) that will be used on the Follow-Up Algorithm.</p>
<b>23</b>	<p>Provide follow-up care according to Follow-Up Algorithm (Figure 4).</p> <p><b>Note: For newborns categorized into a high or high-intermediate bilirubin risk zone, if a subsequent TSB/TcB categorizes them in the high or high-intermediate risk zone again, assess the direction of change in bilirubin measurements. If after two or three TSB/TcB measurements an observable trend indicates that levels are stable or decreasing, follow-up measurements may be discontinued.</b></p> <p><b>If a newborn develops visible jaundice after discontinuation of follow-up measurements, midwives may use clinical judgment to determine the need to re-screen for hyperbilirubinemia. Consider the presence or absence of other clinical factors associated with severe hyperbilirubinemia, including suboptimal feeding, lethargy, dark urine or pale, chalky stools).</b></p>



## APPENDIX

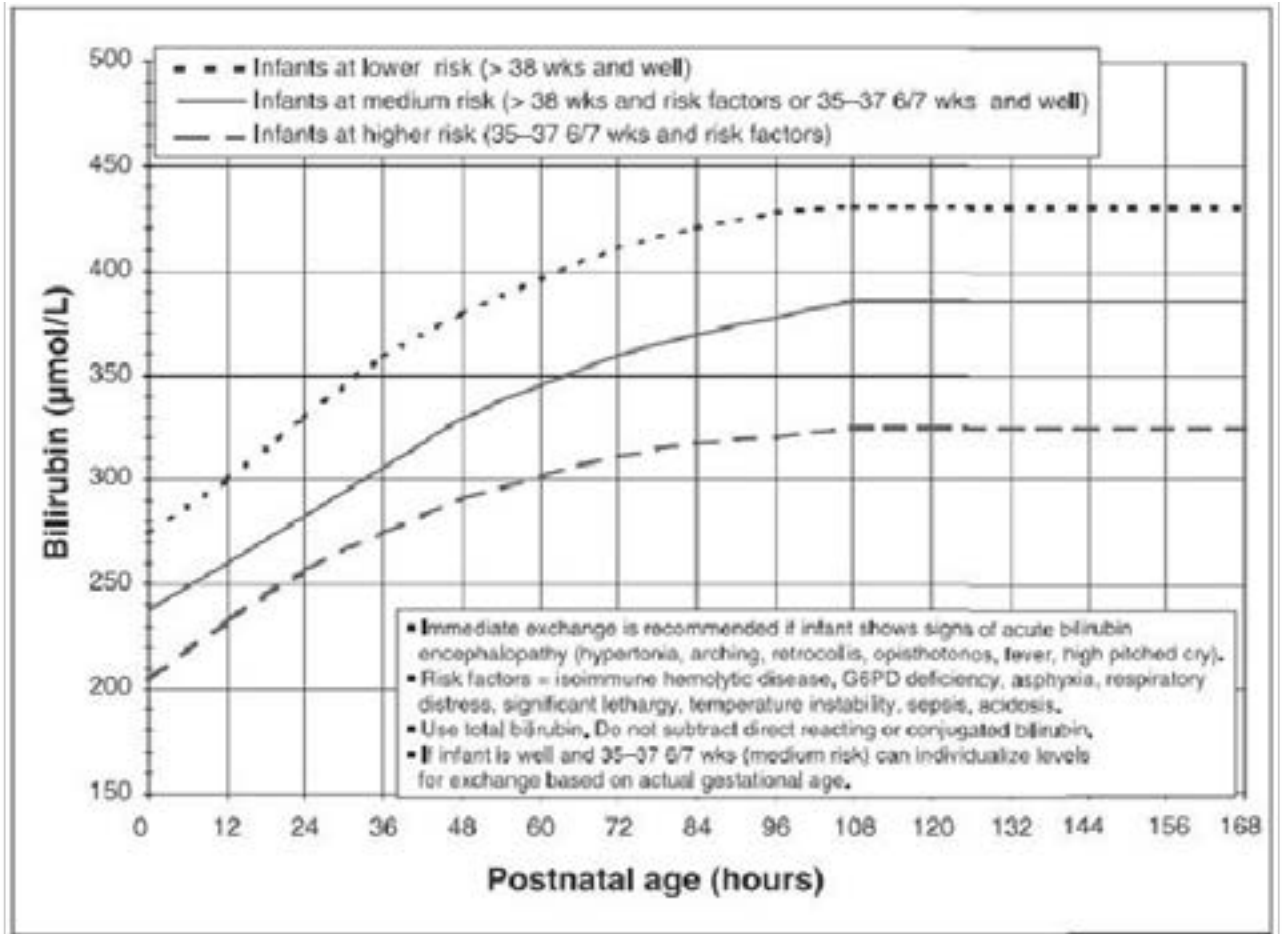
**TABLE 1: RATIONALE FOR MIDWIFERY CLINICAL PATHWAY ADAPTATIONS**

PCMCH/MOH	AOM	CHANGE MADE FROM PCMCH/MOH?	RATIONALE
Clinical Pathway Handbook for Hyperbilirubinemia in Term and Late Pre-Term Infants ( $\geq 35$ weeks), December 2017	Clinical Pathway Manual for Midwifery Hyperbilirubinemia Screening and Management of Phototherapy, November 2019	Yes	Key aspects were adapted by the AOM to incorporate the midwifery philosophy and model of care, and the guidance in the AOM's clinical practice guideline No. 18: Management of Hyperbilirubinemia in Healthy Term and Late Preterm Neonates.
Clinical Pathway for the Management of Hyperbilirubinemia in Term and Late Term Infants ( $\geq 35$ weeks) (algorithm)	Clinical Pathway for Midwifery Hyperbilirubinemia Screening and Management of Phototherapy, November 2019 (care pathway)	Yes	Adapted pathway incorporates midwifery scope of practice as it relates to hyperbilirubinemia screening and phototherapy management for term infants. In conjunction with the AOM CPG on neonatal hyperbilirubinemia, it serves as a practical guide for midwives screening for hyperbilirubinemia and managing phototherapy. Key changes made following consultations with expert midwives and a neonatologist include recommendations regarding consults and transfers of care that may be required over the course of screening and/or phototherapy.
Clinical pathway instructions and recommendations	Clinical pathway instructions and special considerations	Yes	Support for recommendations column removed. Instructions changed to correspond with the AOM midwifery clinical pathway and recommendations included in the AOM CPG on neonatal hyperbilirubinemia.

### FIGURES

Figure 1: Phototherapy graph	Figure 1: Exchange transfusion graph	Yes, order of figures used in care pathway changed.  No changes made to Figures 1 and 2.	Both figures (phototherapy graph and exchange transfusion graph) remain unchanged. However, due to the need for midwives to transfer the care of newborns who meet the threshold for exchange transfusion, this clinical pathway requires that midwives first plot the TSB/TcB value onto the exchange transfusion graph. This enables them to screen out newborns who require additional care and monitoring at the outset of the screening process.
Figure 2: Exchange transfusion graph	Figure 2: Phototherapy graph		
Figure 3: Hour Specific Nomogram	Figure 3: Hour Specific Nomogram	No change	
Figure 4: Follow-Up Algorithm	Figure 4: Follow-Up Algorithm	No change	

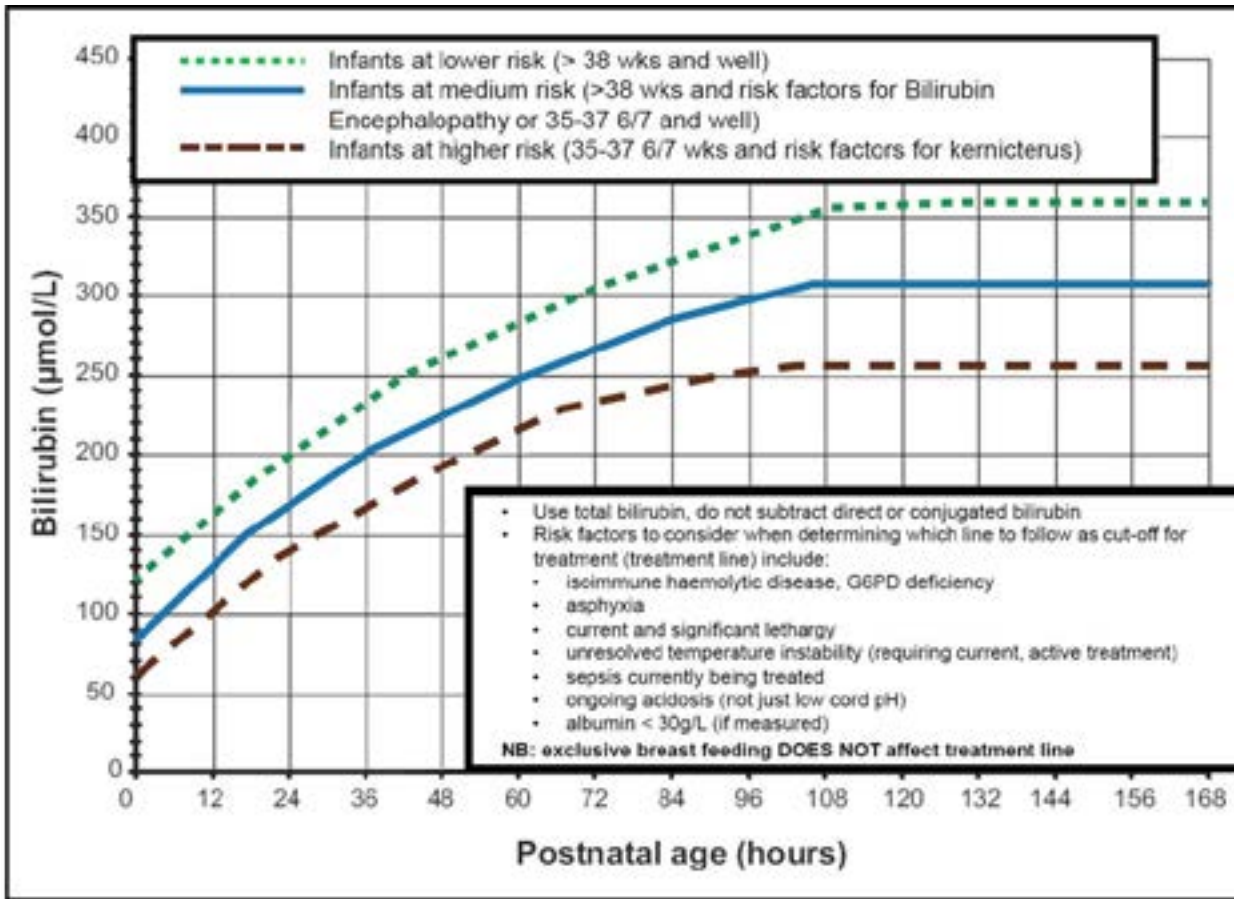
**FIGURE 1: EXCHANGE TRANSFUSION GRAPH**



Guidelines for exchange transfusion in infants of 35 or more weeks' 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) concentrations exceed the line indicated for each category.

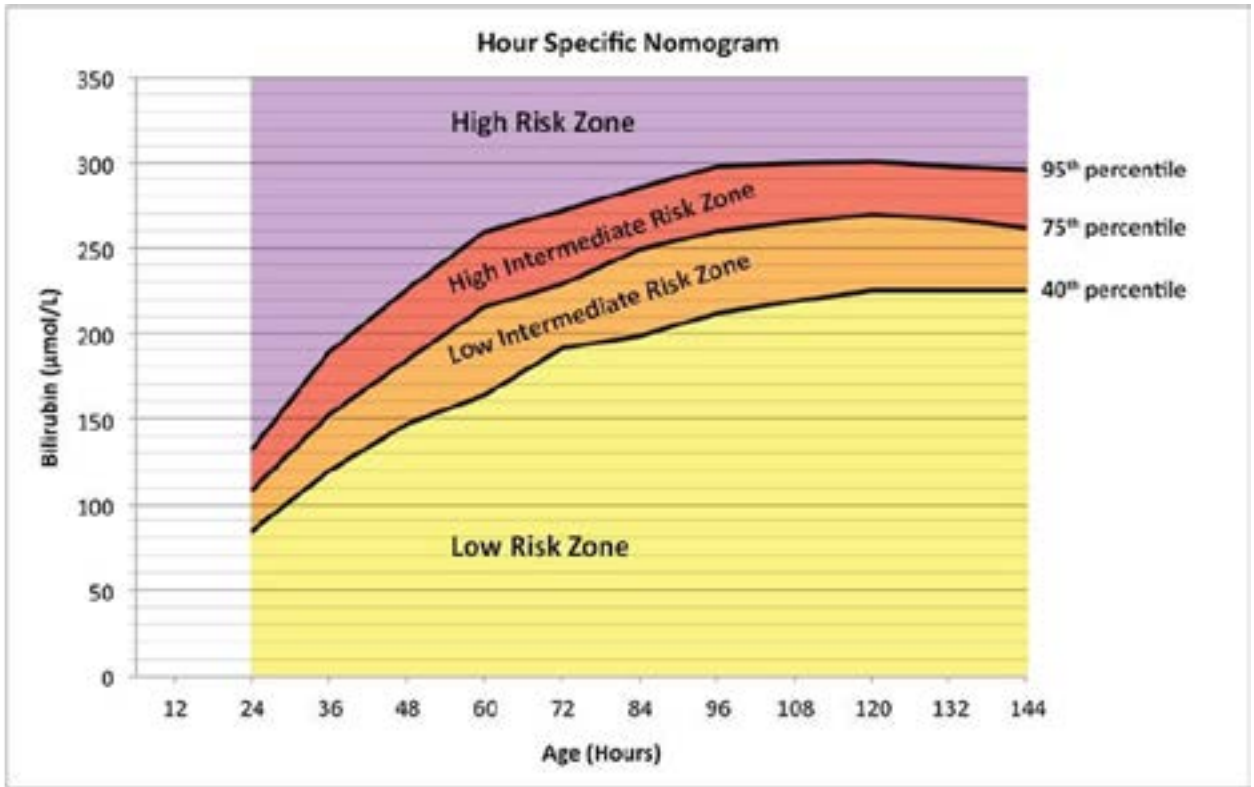
*Reproduced with permission from the Canadian Paediatric Society, (Canadian Paediatric Society, Fetus and Newborn Committee, 2007)*

**FIGURE 2: PHOTOTHERAPY GRAPH**



Adapted with permission from the Champlain Maternal Newborn Regional Program (Champlain Maternal Newborn Regional Program, 2012)

**FIGURE 3: HOUR SPECIFIC NOMOGRAM**



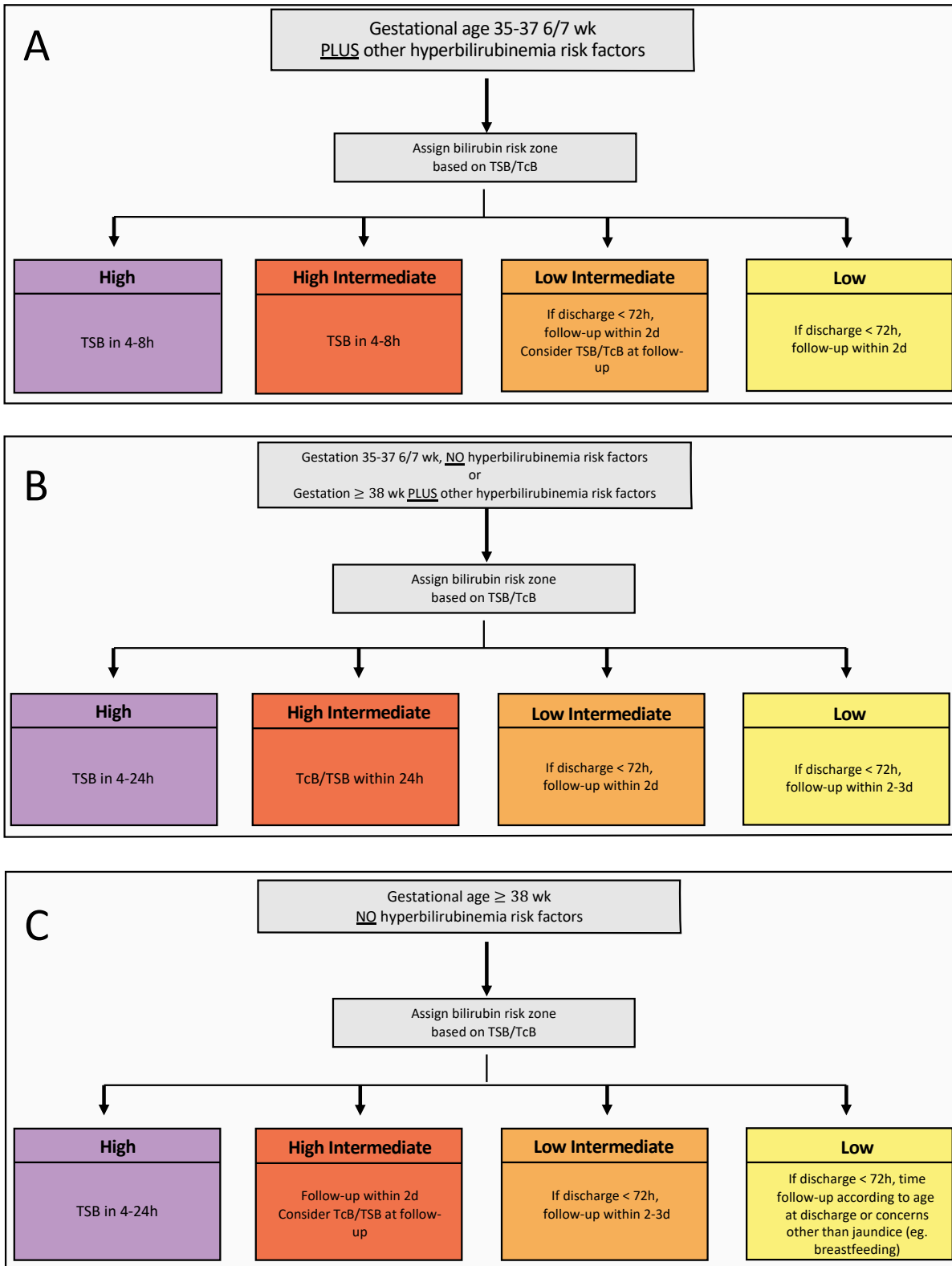
Based on data from Stevenson et al. (Stevenson DK, 2001)

Reproduced with permission from Ontario's Quality-Based Procedures Clinical Handbook for Hyperbilirubinemia in Term and Late Pre-Term Infants ( $\geq 35$  weeks) (Provincial Council for Maternal and Child Health and the Ministry of Health and Long-Term Care, 2017)

**TABLE 2: SEVERE HYPERBILIRUBINEMIA RISK FACTORS**

- Gestational age < 38 weeks
- DAT positive or other known hemolytic disease
- Previous sibling with neonatal jaundice requiring phototherapy
- Cephalohematoma or significant bruising
- Feeding not well established and weight loss (10% of birth weight)
- Ethnic risk factor and family history (East or West Asian, Mediterranean or Middle Eastern descent)

**FIGURE 4: FOLLOW-UP ALGORITHM**



Modeled on Maisels' Algorithm (Maisels MJ, 2009), reflecting the findings of the Clinical Expert Advisory Group.

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