Hyperbilirubinemia Screening, Assessment and Treatment in Newborns Greater Than or Equal to 35 Weeks of Age

Frequently Asked Questions

Purpose

The purpose of this Frequently Asked Questions (FAQ) document is to support the implementation of the Hyperbilirubinemia Screening, Assessment and Treatment in Newborns Greater Than or Equal to 35 Weeks of Age Guidance document. The key to changing clinical practice is providing the "why" for the change to the health care professionals (HCP). This FAQ document will provide consistent evidence-informed answers for all HCPs. The clinical nurse educators (CNEs) will use this document in their individual unit implementations.

Connect Care Graphs for Greater Than or Equal to 35 Weeks of Age

Our unit is currently using the Bhutani Predictive Nomograph for Designation of Risk of Hyperbilirubinemia and Indication for Phototherapy or Exchange Transfusion graph. How will this change on March 18, 2025 in Connect Care?
On March 18, 2025, this nomograph and graph will be replaced with the AAP (2022) Treatment Graphs used to determine the need for phototherapy treatment or the potential for exchange transfusion.

What are the changes with the AAP (2022) Treatment Graphs? How do newborn risk factors for hyperbilirubinemia influence how we utilize the AAP treatment graphs?
There are two sets of risk factors for hyperbilirubinemia:

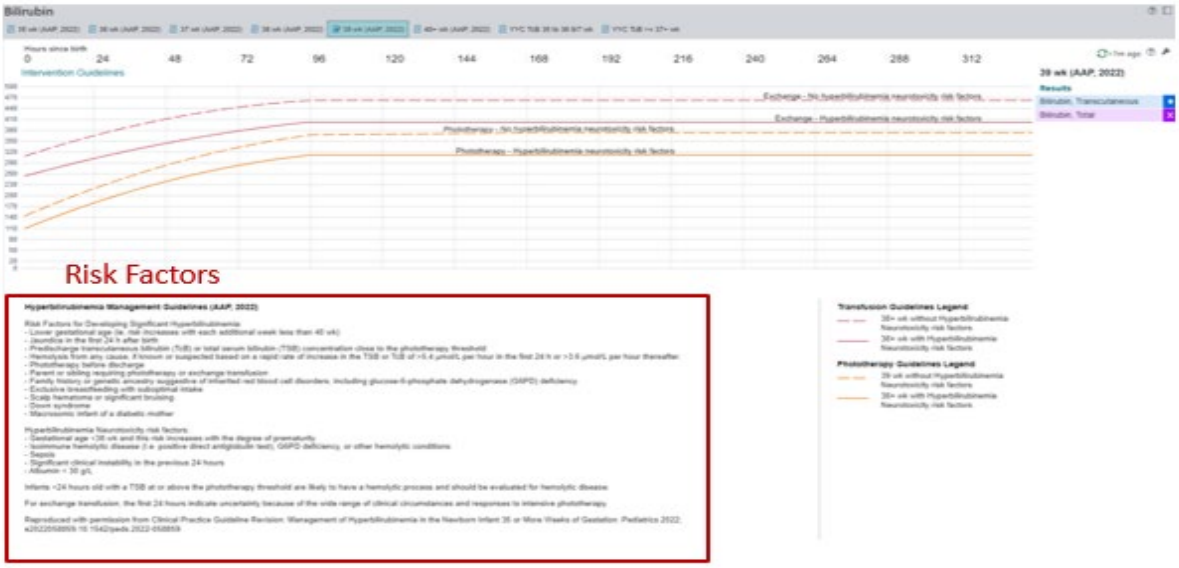
1. **Risk Factors for Developing Significant Hyperbilirubinemia**: There are eleven (11) of these as outlined in the Guidance document.

- The presence of ANY of these risk factors should prompt closer tracking with more frequent TcB and/or TSB screening. They don't alter treatment threshold which is different from the neurotoxicity risk factors

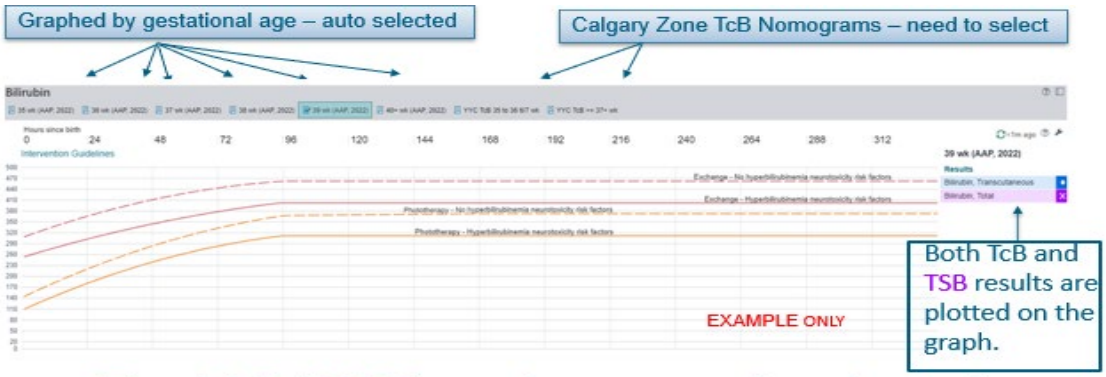
2. **Hyperbilirubinemia NEUROTOXICITY Risk Factors**: There are five (5) and most are similar to the risk factors for developing significant hyperbilirubinemia but with more 'extreme' values. For example, risk factor for developing significant hyperbilirubinemia is family history of hemolytic disease. Neurotoxicity risk factor is confirmed hemolysis in this newborn.
   - Neurotoxicity risk factors alter the threshold for treatment (lower thresholds for both phototherapy and exchange transfusion).

Each AAP graph in Connect Care has 4 lines:
phototherapy threshold - with Hyperbilirubinemia NEUROTOXICITY risk factors (——)
phototherapy threshold – with NO Hyperbilirubinemia NEUROTOXICITY risk factors (– – –)
exchange threshold - with Hyperbilirubinemia NEUROTOXICITY risk factors (——)
exchange threshold –with NO Hyperbilirubinemia NEUROTOXICITY risk factors (– – –)

See below graph example for the location of the Risk Factors and the threshold lines.



How is the proper graph selected in Connect Care?
The current workflow to establish gestational age will not change and Connect Care will utilize this input information to auto select the correct gestational age graph. The gestational age specific graph utilized for determining the need for phototherapy is based on the birth gestational age and does not change over time**.**

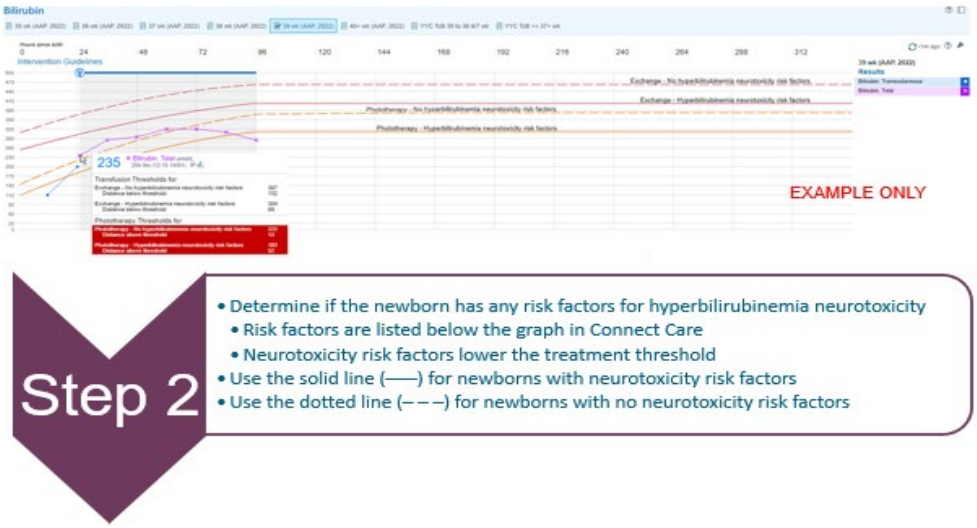


The AAP (2022) graphs are used to determine the need for phototherapy treatment or the potential for exchange transfusion.

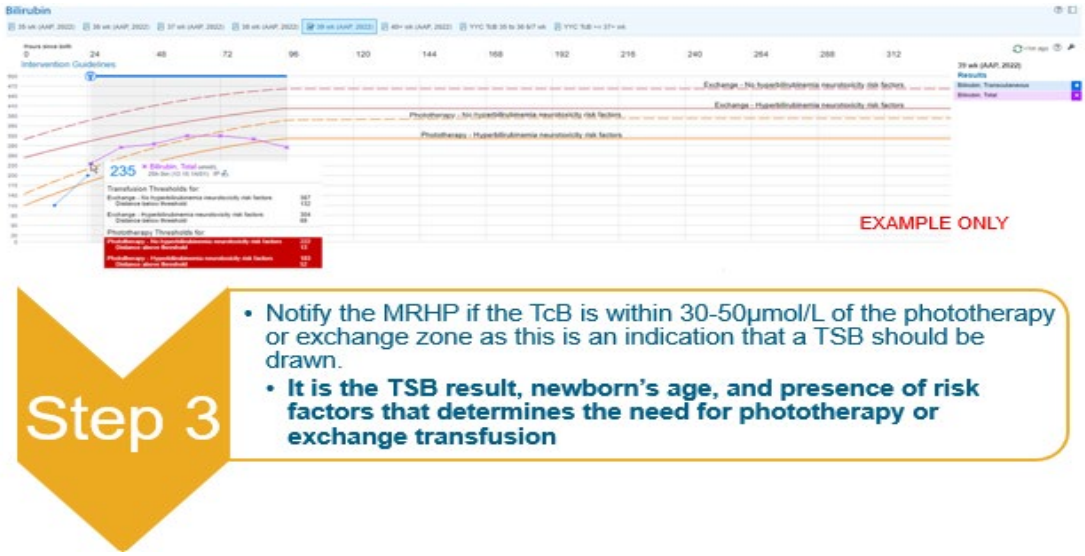
How do you use the AAP Graphs?

Step 1

- Obtain TcB or TSB – results are automatically populated into the appropriate graph in Connect Care
  - TcB results are blue dots (●)
  - TSB results are purple x (x)



The gestational age less than 40 weeks for significant hyperbilirubinemia risk factor and gestational age less than 38 weeks for hyperbilirubinemia neurotoxicity risk factor is already accounted for in the threshold lines for each gestational age. Determine if the other neurotoxicity risk factors besides gestational age is present.



When should the RN or LPN notify Most Responsible Health Practitioner (MRHP) of the TcB and/or TSB results to determine if further investigation or other management is required?
The RN or LPN in consultation with the MRHP should refer to the appropriate graph to determine the potential need for phototherapy treatment or the potential for exchange transfusion and referral to Neonatology. The decision to start and/or stop treatment with phototherapy or exchange transfusion should be based on a TSB level.

If a TcB value is within 30-50 µmol/L of the phototherapy threshold or greater than the phototherapy threshold on the gestational age specific graph, the MRHP should order a TSB to confirm the result and determine the need for phototherapy.

Care should be escalated when a newborn's TSB reaches or exceeds the escalation-of-care threshold, which is *35* µmol/L below the appropriate exchange transfusion threshold. Refer to Section 6 Escalation of Care and Exchange Transfusion of the Hyperbilirubinemia Screening, Assessment and Treatment in Newborns Greater Than or Equal to 35 Weeks of Age document for further information.

Transcutaneous Bilirubinometry (TcB) or Total Serum Bilirubin (TSB)

What is the frequency the HCP needs to monitor newborns for jaundice?
TcB screening should be performed on all newborns within 12 to 24 hours after birth. TcB performed at less than or equal to 12 hours is suggested for newborns with risk factors.

In the absence of clinical symptoms, TSB screening should be completed at approximately 24 hours after birth and may be collected with the Newborn Blood Spot Screen before discharge. TSB screening is completed at less than or equal to 12 hours of age for newborns with risk factors.

Continue routine jaundice monitoring with a TcB or TSB until values have stabilized or there is a downward trend. If values are not stabilizing or if they are trending upwards, monitoring should continue. Note that TcB screening should not extend beyond 10 days after birth.

What are the criteria for performing a TcB measurement?
TcB measurement should only be performed using a meter that has been correctly validated according to Point of Care program standards on newborns that meet all the following four criteria:

a. Less than or equal to 10 days old
b. Greater than or equal to 30 weeks gestation at birth
c. Completed a course of phototherapy at least 24 hours before the TcB measurement, and
d. Have not received an exchange transfusion.

Should the TcB measurement be taken only on the forehead? What should you do if the newborn has a swollen forehead or CPAP equipment?
TcB measurements should be taken consistently on the same site, either the forehead or the sternum, and the measurements should be documented in the newborn's health record. TcB should not be used during periods of phototherapy, including for a 24-hour period after cessation of phototherapy. With the resumption of TcB readings greater than 24 hours after stopping phototherapy, the preferred location for performing a TcB reading is either the forehead or sternum, consistent with pre-phototherapy management. The AegisPOC documentation will be upgraded in the future to include the location where the TcB measurement was taken.

Are there newborns who will consistently have falsely high TcB readings?
A small minority of newborns will consistently have falsely high TcB readings which prompt unnecessary blood draws for TSB. This is more common in dark-skinned newborns. For newborns with two consecutive falsely high TcB readings, it is reasonable to consider discontinuing further TcB testing and rely on TSB results to guide further management. In this context. A falsely high TcB reading refers to a TcB result that inappropriately results in a TSB draw because it falsely indicates the need for phototherapy and/or exchange transfusion on the AAP graphs.

Phototherapy

In the new guidance document, newborns with a TcB level within plus or minus 30-50 µmol/L of a phototherapy line, requires confirmation with a TSB to determine need for phototherapy. Previously this value was 50 umol/L of the phototherapy threshold. Why was this value decreased to 30 µmol/L?
The authors of the AAP, 2022 guidelines advocate for this approach based on the design of the new graphs which have modified treatment thresholds compared to their previous guidelines from 2004.

How long should phototherapy continue?

The MRHP is responsible for ordering phototherapy and making any additional diagnostic testing and treatment decisions, including transferring to an appropriate level of care or other care provider if required. When deciding on whether to begin phototherapy or proceed with exchange transfusion, the clinician should consider the hour-specific TSB, gestational age, and the presence of significant hyperbilirubinemia risk factors and/or neurotoxicity risk factors.

At the discretion of the MRHP and in consideration of the condition of the newborn, a follow-up TSB level is recommended no more than 12 hours following the initiation of phototherapy, as per the AAP 2022 guidelines. A follow-up TSB level is recommended four hours following initiation of phototherapy if:

a) Previous TSB levels demonstrate a pattern of a rapidly rising bilirubin level, or
b) There is a critical TSB level greater than 400 µmol/L.

Consider stopping phototherapy when the TSB has decreased by at least 35 µmol/L below the hour-specific threshold. It is reasonable to consider a longer period of phototherapy if risk factors for rebound hyperbilirubinemia exist. Risk factors for rebound hyperbilirubinemia include:

- need for early (for example, less than 48 hours) phototherapy,
- hemolytic disease,
- gestational age less than 38 weeks, and
- higher TSB at the time of phototherapy discontinuation in relationship to the phototherapy threshold
    - The closer a newborn is to treatment threshold, the more likely they will rebound above the treatment threshold. For a phototherapy treatment threshold of 300, a newborn with a post phototherapy TSB of 100 is less likely to rebound back to a TSB of great than 300 than a newborn with a post phototherapy TSB of 250. Both are below the treatment line but one is more likely to rise above it again.

When should you test for rebound hyperbilirubinemia?

Testing for rebound hyperbilirubinemia should occur 12 to 24 hours after stopping phototherapy or at 6 to 12 hours after stopping phototherapy for newborns with risk factors for rebound hyperbilirubinemia. This provides enough time for the bilirubin concentration to demonstrate whether there is rebound hyperbilirubinemia. Rebound

hyperbilirubinemia should be treated according to the recommendations above regarding the initiation of phototherapy. TcB screening can resume when a minimum of 24 hours has passed since stopping phototherapy.

Based on the best available evidence, TcB screening for newborns greater than 30 weeks gestational age can be resumed 24 hours after the discontinuation of phototherapy.

Phototherapy Equipment

What is effective phototherapy?

It is a combination of:

- **The right device**: Devices emitting a light wavelength within the blue-green spectrum of 430 to 490 (nm) which is considered the most effective for skin penetration and maximum bilirubin conversion.
    - Bilirubin molecules absorb the energy of light and undergo a photochemical reaction.
    - Water-insoluble bilirubin (unconjugated bilirubin) is converted into a water-soluble form (lumirubin) that can then be excreted without requiring conversion to conjugated bilirubin in the liver.

- **The right dose**: Irradiance refers to the intensity of the light emitted from the phototherapy device.
    - Efficacy of phototherapy is quantified by the intensity or irradiance of the light source.
    - Radiometer detects the light intensity or irradiance in the blue green spectrum.
    - Refer to the manufacturer's manual for recommended irradiance testing and levels to ensure the phototherapy device is working properly **and** is properly positioned relative to the patient.
    - Irradiance is not cumulative – each piece of phototherapy equipment should be measured independently to ensure it is providing adequate intensity.
    - CPS (2018) position statement recommends that a high intensity of light (greater than 30 µW/cm2/nm) is applied to the greatest possible surface area of the newborn.

- **The right exposure**: Amount of exposed skin surface area
    - Absorption occurs only in the outermost 2 mm of skin.
    - As much skin as possible should be exposed to the phototherapy device light.
    - Increasing the number of phototherapy devices does not increase the intensity of the light but it does increase the amount of skin exposed to the phototherapy light.
    - An overhead phototherapy device combined with a bili-blanket can increase the amount of skin exposed to the phototherapy light.

- **The right duration**: Duration of treatment is determined by the response to phototherapy, including the magnitude and rate of decrease in the TSB.

There are several devices for providing phototherapy, including banks of lights, single halogen bulbs, bili-blankets and newborn cots with integrated phototherapy. Spectral irradiance of phototherapy equipment shall be measured by the health care team with an appropriate radiometer. It is important that the selected radiometer is approved by the manufacturer of the phototherapy device for measuring irradiance. Where can the HCPs find this information?

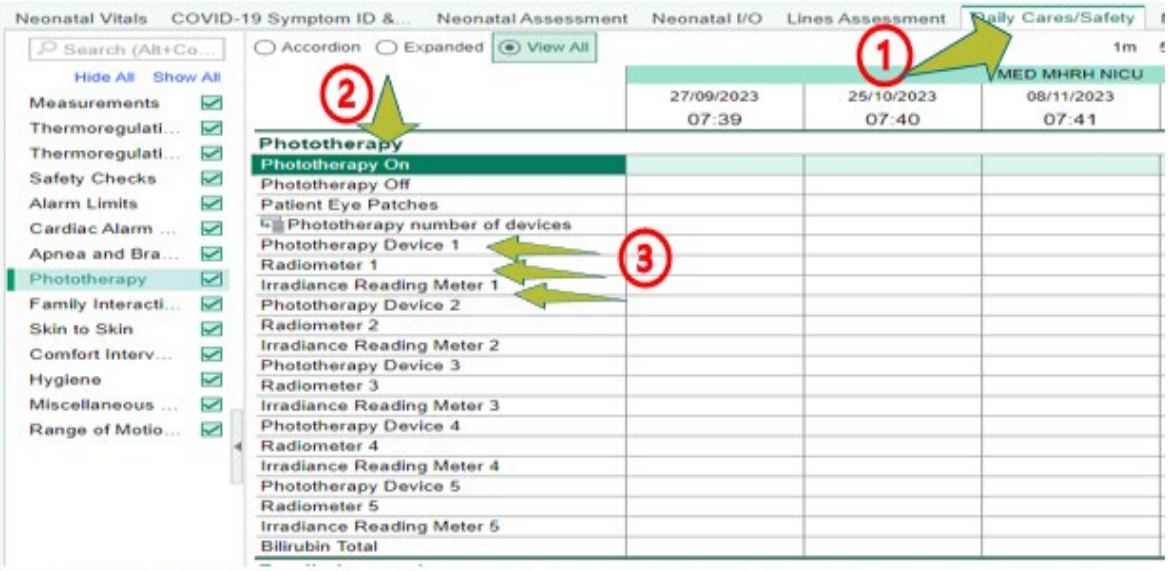
Phototherapy is used in the clinical management of newborns diagnosed with hyperbilirubinemia. A Phototherapy Devices & Radiometers table was created with the information provided by AHS Clinical Engineering – Center of Expertise, Capital Management. Phototherapy is used in the clinical management of newborns diagnosed with hyperbilirubinemia. Each type of phototherapy device must be paired with an appropriate manufacturer-approved radiometer (light meter) to properly determine the intensity of the light. Pairing the Correct Light Meter with Phototherapy Devices to Treat Hyperbilirubinemia Issue.

Refer to the manufacturer's manual for recommended irradiance testing and levels to ensure the phototherapy device is working properly.

How do I document the phototherapy devices used, brand of radiometer(s) and irradiance level(s) in Connect Care?

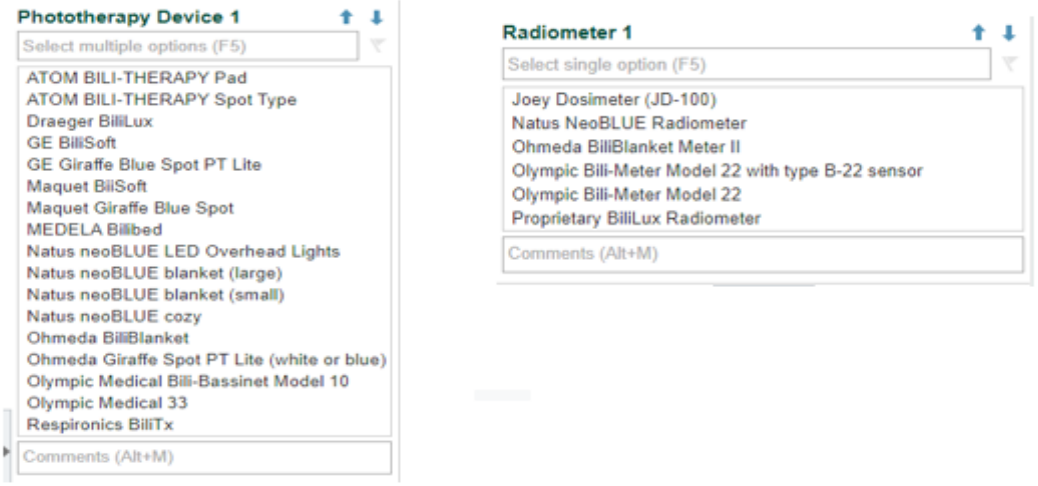
A new Connect Care phototherapy flowsheet will go live on March 18, 2025. The phototherapy flowsheet contains rows for documenting the initiation and discontinuation of phototherapy, as well as rows for documenting the phototherapy devices and irradiance reading meters being used during phototherapy and the respective irradiance levels.

Documentation in Connect Care



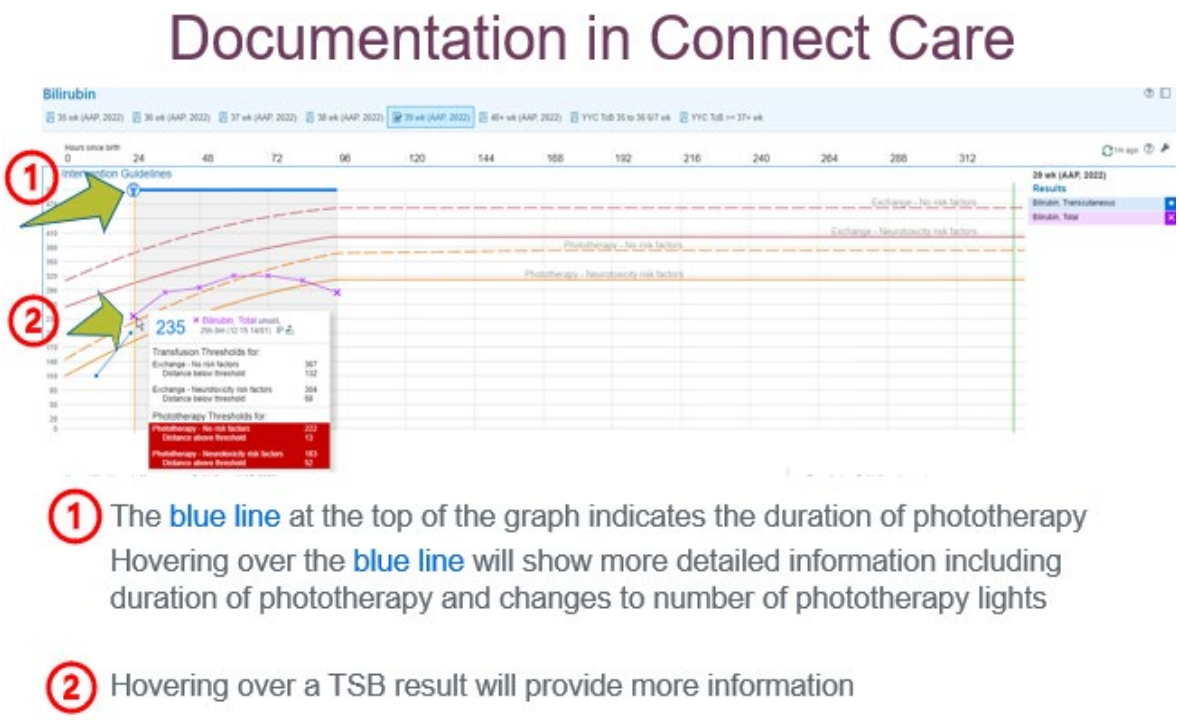
1. Locate the phototherapy section in the Daily Cares/Safety flowsheet and chart as applicable
2. When phototherapy is *on* or *off*, an indicator will be automatically populated on the phototherapy graph

Documentation in Connect Care



3. When you click on phototherapy device and radiometer, a drop-down list appears. Click on the phototherapy device and the radiometer used for that device. You can select up to 5 phototherapy devices. Enter the numeric value of the irradiance reading for each meter.

You will also be able to see the information documented in the Phototherapy flowsheet regarding the initiation and discontinuation of phototherapy and the number of phototherapy devices used for the newborn when viewing the AAP Graphs.



Are Connect Care downtime forms available for the AAP graphs?
Connect Care downtime forms will not be available. Copies of the NICE Graphs (23 to 34 weeks gestation) and AAP graphs (35 to greater than or equal to 40 weeks gestation) will be available for the clinical nurse educators to download from the MS Team Channel (titled Hyperbilirubinemia in the Newborn) and save in a file on their unit.

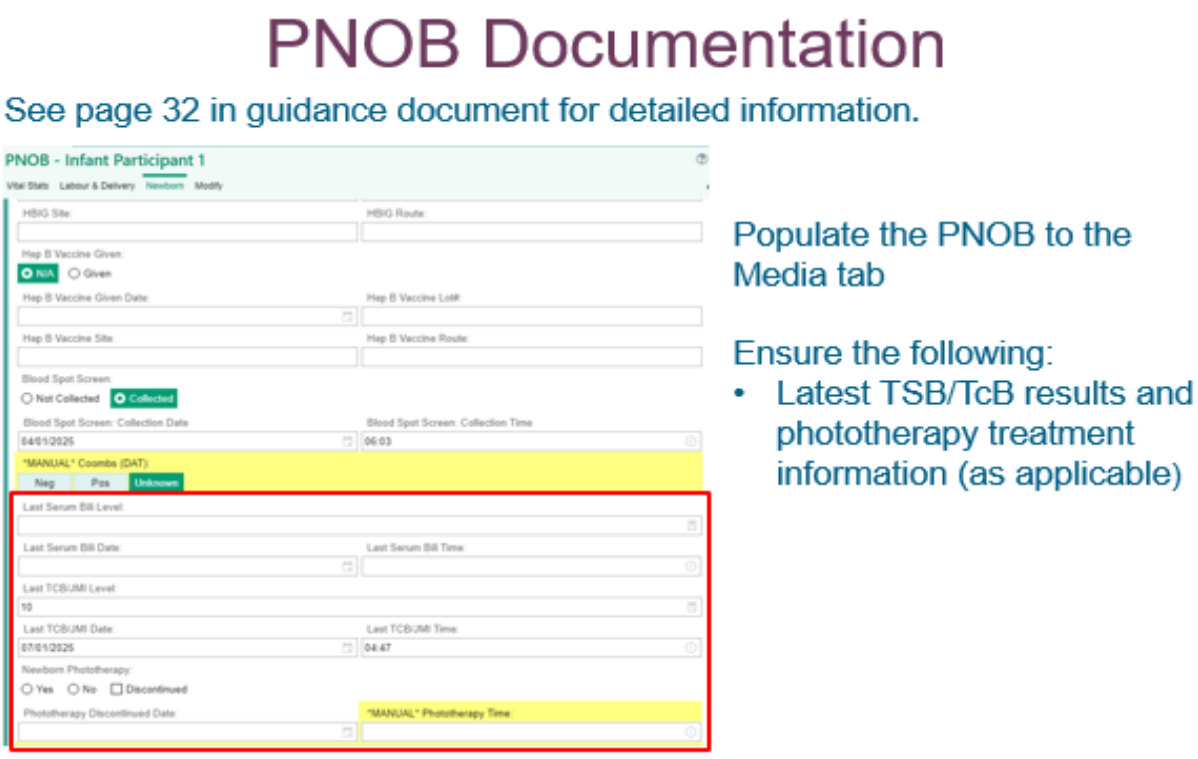
Why is a DAT (Direct Antiglobulin Test) not useful as a universal screening tool?
The DAT (Coombs) test has poor performance for predicting significant hyperbilirubinemia. It is appropriate to order a DAT for diagnostic purposes once a baby has presented with significant hyperbilirubinemia or has a rapid rise in TSB levels. See Appendix for background information.

Community Management

What should be included in outpatient follow-up plans?

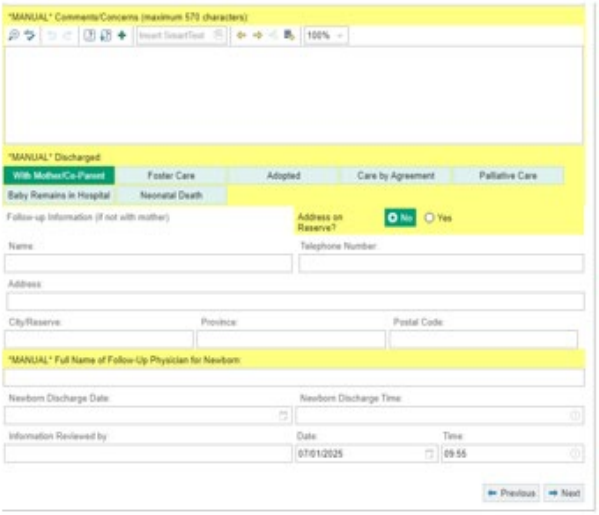
These plans should be established before discharge from hospital and include:

- identification of a community physician or midwife
- referral to community physician or midwife within 7 days of discharge
- Ambulatory Referral to Public Health Postpartum at the time of discharge (Hyperbilirubinemia Clinical Management - Public Health Services Across the Province)
- Completion of PNOB (Completing the PNOB for Public Health Follow-up)
- If outpatient follow-up lab work is ordered (for example, outpatient TSB), provide family with requisition and instructions for testing



PNOB Documentation

See page 32 in guidance document for detailed information



Ensure the following:

- A clear discharge plan, including MRHP, is particularly important when follow-up in the community is required
- Accurate discharge address, telephone number(s), guardianship contact information, gestational age, discharge date and time
- Follow-up physician name (if available)

Our practice was to print the Bhutani Predictive Nomogram and give it to all parents on discharge with jaundice education. Do we need to print the new AAP graph on discharge for parents or is this no longer necessary?

It is not necessary to print the new AAP graph on discharge for parents. Public Health has access to these graphs in Connect Care.

What do you need to consider if follow up testing is required?

The MRHP shall make arrangements with the guardian(s) to have a TcB or TSB collected within 24 hours of hospital discharge for the following newborns:

- received phototherapy and discharged less than 72 hours since birth (regardless of risk factors)
- received phototherapy and discharged less than 96 hours since birth with risk factors.

NOTE: Some regions do not have access to a lab for bloodwork on holidays/weekends and not every community lab is able to draw TSB samples. This should also be considered when ordering a requisition for community TSB testing.

Refer to Service Locations on the Alberta Precision Laboratory's Webpage: https://www.albertahealthservices.ca/findhealth/service.aspx?id=4245

Appendix – Background Information for Direct Antiglobulin Test (DAT)

Hemolytic disease of the fetus and the newborn (HDFN):

- Most common type of HDFN is due to ABO incompatibility.
- ABO incompatibility occurs in approximately 15% to 25% of pregnancies and tends to be less severe than Rh incompatibility.
- The incidence of positive DAT testing in ABO HDFN is very low at around 1%, and of that group, only approximately 23% of newborns develop clinically significant jaundice; hence, DAT is a poor screening test for predicting newborns that require treatment.
- Source: Theis SR, Hashmi MF. Coombs Test. [Updated 2022 Sep 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK547707/

TcB is an effective screening tool:

TcB was highly predictive (odds ratio 3.1, 95% confidence interval: 2.4–4.0) and nearly as accurate as the TSB (area under the curve, 0.90).

- Low (less than 55 mmol/L) and high (greater than or equal to 90 µmol/L risk TcB cutoffs demonstrated a negative predictive value of 98% and positive predictive value of 85%, respectively.
- Among high-risk ABO incompatible DAT positive newborns, TcB at 6 hours after birth is highly predictive of the need for phototherapy less than or equal to 24 hours.
- Source: Papacostas, Michael F., Dwight M. Robertson, Matthew D. McLean, Keisha D. Wolfe, Hui Liu, and Timothy R. Shope. "Sixth-hour transcutaneous bilirubin and need for phototherapy in DAT positive newborns." Pediatrics 149, no. 3 (2022).

Problems with DAT as a screening tool

Fifteen to twenty-five per cent of all maternal/newborn pairs are ABO incompatible.

- Only approximately 1% of these women will have high-titre IgG antibodies.
- Of newborns born of these ‘incompatible’ pairs, 33% of these newborns will have a positive DAT but very few will go on to develop HDN with its incidence only about 0.02–1.4% for all births, highlighting the limited role the screening DAT has in identifying newborns at risk of HDN.

When should the DAT be requested?

- To investigate the etiology of haemolysis
- It is appropriate to request a DAT in a newborn with anaemia, hyperbilirubinemia, high reticulocyte count and high lactate dehydrogenase.

There are several limitations of the DAT test.

- A positive DAT has a poor predictive value for ABO HDN
- A positive DAT does not rule in ABO HDN and a negative DAT does not rule out ABO HDN. Additionally, a negative DAT does not exclude a non-immune haemolytic aetiology underlying clinically significant hyperbilirubinemia.

Can we use the DAT to identify newborns at risk of developing ABO HDN? In a newborn with a group O mother, should a DAT be routinely requested to identify if the newborn is at risk of ABO HDN (outcome)?

- As a screening test, the DAT has been identified as having a poor positive predictive value (PPV) for identifying newborns at risk of clinically significant hyperbilirubinemia.
- Across studies, a positive DAT had a PPV of 12–53% when used to identify newborns at risk of developing clinically significant hyperbilirubinemia and/or hemolysis.
- Another practice is selective cord testing (ABO typing and DAT) of newborns born to blood group O positive mothers rather than routine testing of all newborns.
- This practice is not supported by transfusion expert groups, including the AABB.
- There are other well-established adjunct clinical screens to identify newborns at risk of hyperbilirubinemia, including transcutaneous bilirubin measurements prior to discharge and follow-up within 48 h post discharge by a healthcare provider.
- Source: Keir A, Agpalo M, Lieberman L, Callum J. How to use: the direct antiglobulin test in newborns. Arch Dis Child Educ Pract Ed. 2015 Aug;100(4):198-203. doi: 10.1136/archdischild-2013-305553. Epub 2014 Nov 13. PMID: 25395493.