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NEONATAL BUSINESS RULE
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SUMMARY	To guide clinicians in the appropriate use of transcutaneous bilirubinometer for neonates within Newborn Care Centre.
Key Words	Transcutaneous bilirubinometer, TcB, jaundice, treatment, phototherapy, neonate

Royal Hospital for Women (RHW)
NEONATAL BUSINESS RULE

Health
South Eastern Sydney
Local Health District

Neonatal Jaundice –Transcutaneous Bilirubin (TcB) Measurement

RHW CLIN148

Contents

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Within this document we will use the term woman, this is not to exclude those who give birth and do not identify as female. It is crucial to use the preferred language and terminology as described and guided by each individual person when providing care.

1 BACKGROUND

The usual procedure for measuring bilirubin in newborns is to collect a sample of blood and test it in the laboratory (serum bilirubin [SBR] measurement). However, there are devices that measure bilirubin by sending a flash of light through the skin (transcutaneous bilirubin [TcB] measurement). This method is painless and gives an almost immediate result.[1]

The aim of this CBR is to guide appropriate TcB use using the Dräger JM-105 device in neonates within NCC.

2 RESPONSIBILITIES

2.1 Staff

2.1.1 Medical – be appropriately trained in the use of the Dräger JM-105 device, determine the need for TcB measurement or SBR collection in neonates, perform TcB measurement using Dräger JM-105, interpret and plot the result, prescribe and cease Phototherapy (PT) treatment.

2.1.2 Nursing/midwives– be appropriately trained in the use of the Dräger JM-105 device, carry out the daily light calibration and document in the JM-105 (Appendix 1) Resource Manuals. Determine need for TcB testing, perform TcB testing, interpret and plot results, liaise with medical staff to inform of results and need for further testing, perform required testing as per medical officer, initiate prescribed PT treatment, cease treatment.

3 PROCEDURE

3.1 Equipment

- Dräger Jaundice Meter JM-105
- Appropriate gestation neonatal jaundice treatment threshold graph

3.2 Clinical Practice

3.2.1 When to do a TcB measurement

Note
In the first instance a TcB measurement should be used if possible, for the well neonate who is jaundiced at:
• ≥ 35+0 weeks gestation at birth and
• ≥ 24 hours of age.

- **Perform urgent serum bilirubin (SBR) on all neonates < 24 hours of age presenting with jaundice** (regardless of whether a TcB has been done).[7]
- Perform TcB (+/- SBR depending on gestation and rate of rise) every 6-24 hours in the first 72 hours of life for any visible jaundice appearing after 24 hours of age.
- Look for risk factors such as:
  - Prematurity
  - Isoimmune haemolytic disease
  - Asphyxia
  - Polycythaemia
  - Cephalhaematoma/bruising
  - Temperature instability
  - Sepsis or acidosis
  - Maternal diabetes
  - History of sibling with significant jaundice
  - Low serum albumin < 30g/L
  - East Asian race or ethnic group at risk for Glucose 6 Phosphate Dehydrogenase (G6PD) deficiency.
- These may lower your threshold for PT &/or increase the frequency of TcB/SBR testing.
- Do not perform TcB measurements while neonate is actively receiving PT or once PT is discontinued. There is inconclusive evidence to support the use of TcB measurement after cessation of PT.
- Continue regular TcB measurements for neonates ≥35 weeks gestation with a TcB below the gestational line. These neonates may not need PT provided they are well.[7]

3.2.2 SBR Measurement[15]

- SBR measurement remains the ‘gold standard’ for jaundice treatment decisions.
- Measure SBR level if:
  - A TcB is not available
  - The TcB measurement is ≥ 250 micromol/L, or the result is on, or within 20 micromol/L of the PT threshold line for gestation at birth
  - The neonate is:
    - Unwell
    - < 35 weeks gestation at birth
    - < 24 hours of age

  - Undergoing PT or has undergone PT (there is insufficient evidence to recommend the use of TcB after phototherapy)
- It is essential to follow up bilirubin results in a timely way or ensure clinical handover of requirement to follow up.
- Both venous and capillary total SBR results should be considered equivalent measures. \
- The total SBR should be used to determine appropriate treatment, rather than the unconjugated fraction of bilirubin. I
- f the SBR is < 50 micromol/L below the PT treatment threshold line repeat the SBR within 12 to 24 hours.
- Perform a simultaneous TcB and SBR for all neonates < 35 weeks gestation.

Note
If at any stage there is clinical concern for jaundice ≥ 35 weeks gestation and ≥ 24 hours of age, a TcB measurement can be performed.

3.2.3 Using the Dräger Jaundice Meter JM-105

1. Perform daily calibration and document result in resource manual
2. Remove the Jaundice Meter JM-105 from the docking station.
3. Clean the probe with a 70% alcohol swab prior to use.
4. Press the “switch-on” power button.
5. Check that the green “ready” light is on.
6. Select “Menu”, select “Measure”, press “OK.”
   - The letters “AVE” with the number of measurements selected appears on the display
7. Place the jaundice meter probe tip flat against the neonate’s skin. The forehead is the ideal location to perform the test on.
8. Press lightly until an audible click occurs.
9. Lift the jaundice meter from the skin.
10. Wait for the green light and repeat the procedure x2. Ensure that a new spot is chosen for each repeat test.
11. Discuss the result with the resident medical officer (RMO) to decide whether an SBR is required.
12. Plot the result on the appropriate neonatal jaundice treatment threshold graph.
13. Clean the probe with an alcohol swab after use.
14. Return the device to the docking station.

3.3 Documentation

- TcB & SBR results on the neonatal jaundice treatment threshold graphs appropriate to gestational age
- eMR
- SNOC
- eRIC

3.4 Education Notes

- TcB devices estimate SBR non-invasively. The JM -105 devices determine the yellowness of a neonate's subcutaneous tissue by measuring the difference in the optical densities for light in the blue (450 nm) and green (550 nm) wavelength regions. The measuring probe has two optical paths. This method allows for a more precise measurement of yellowness in an neonate's subcutaneous tissue by minimising the influences of the melanin pigment and the skin maturity. The device does not have a user calibration. The system does include a checker that measures the intensity of light from the device to ensure the light output is within range.
- TcB devices are widely used in term and near-term neonates for estimation of bilirubin in combination with SBR levels. Its accuracy has been adequately demonstrated in term neonates below treatment levels (bilirubin less than 250 micromol/litre).[2,3,4]
- TcB measurements are non-invasive, reduce the requirement for blood draws by over 70% and improve the access to screening. It reduces the nurses' time to screen and provides immediate results at the point of care.[5]
- Data were collected on 8319 TcB measurements at 27 nursery sites in the US; 925 total SBR levels were matched to a TcB value.[7] The mean TcB – SBR difference was 14.4 µmol/L ± 30.4 µmol/L & the correlation between paired measurements was 0.78. In the multivariate analysis TcB – SBR differences were 11.5 µmol/L higher in African-American newborns than in neonates of other races (P < .001). The TcB – SBR difference also varied significantly based on brand of TcB meter used and hour of age of the infant (the tendency for TcB to underestimate SBR increased with advancing newborn age). TcB levels were less accurate at higher levels: At SBR ≥ 256 µmol/L, corresponding TcB value averaged 24 µmol/L lower with substantial variability often > 34 µmol/L. At lower SBR levels, TcB tended to overestimate the value.[8]
- The high sensitivity of TcB to detect hyperbilirubinaemia suggests that TcB devices are reliable screening tests for ruling out hyperbilirubinaemia in newborns. Positive test results would require confirmation through serum bilirubin measurement.
- The use of TcB compared to visual inspection in neonates ≥ 35 weeks gestation in acute-care and community settings has been associated with significant improvements in laboratory utilization, patient care, convenience, and safety.[9]
- TcB measurements were influenced by skin pigmentation: the darker the skin, the larger the underestimation. Larger mimicked melanosome volume fractions and higher bilirubin levels led to larger underestimations of the measured TcB, compared to an unpigmented epidermis. In the in vitro setting of a study, these underestimations amounted to 26–132 µmol/L at a TcB level of 250 µmol/L.[10]
- There was a strong linear correlation between both determinations of serum bilirubin at the forehead and sternum (r=0.704; p<0.01 and r=0.653; p<0.01, respectively). There was correspondence of the mean values of transcutaneous bilirubin measured on the sternum (9.9±2.2mg/dL) compared to plasma levels (10.2±1.7mg/dL), but both differ from the values measured on the forehead (8.6±2.0mg/dL), p<0.05. In newborn term infants with no hemolytic disease, measuring of transcutaneous bilirubin on the sternum had higher accuracy as compared to serum bilirubin measurement on the forehead.[13]
- A systematic review showed that TcB measurements before and during phototherapy on covered skin show acceptable accuracy compared with SBR measurements in both term and preterm newborns. This suggests that, in addition to the use of TcB for screening of hyperbilirubinemia before the application of phototherapy, the use of TcB may be extended

to the use during phototherapy, provided it is measured on covered skin. Evidence of the best method of skin covering does not exist yet, but the use of photo-opaque patches can be recommended. The forehead is the preferred location for measurement of TcB; however, the sternum is also safe to use. The use of TcB during phototherapy on uncovered skin is not advised. More studies are needed to evaluate the accuracy of TcB compared with SBR after the application of phototherapy on covered skin.[14]

- The potential harms associated with under diagnosis include Auditory neuropathy spectrum disorder and bilirubin induced neurologic damage (BIND).[15,1]
- Risk of a ≥ 50 µmol/L underestimation of SBR by TcB was significantly increased in newborns with birth weights < 2500g.[8] Failing to identify significant hyperbilirubinemia is the worst outcome of TcB screening. Therefore, TcB results need to be interpreted cautiously in newborns with birth weights < 2500g, particularly in the first 48 hours of life.

3.5 Abbreviations

SBR	Serum Bilirubin	TcB	Transcutaneous Bilirubinometer
PT	Phototherapy	RMO	Resident medical officer
G6PD	Glucose 6 Phosphate Dehydrogenase		

3.6 Related Policies/procedures

- RHW NCC CBR- Neonatal Jaundice – Management in neonates <32 weeks
- NSW Health 2016. Doc Number GL2016_027. Neonatal Jaundice - Identification and management in neonates ≥32 weeks gestation
- RHW NCC CBR- Exchange Transfusion

3.7 References

1. Okwundu CI, Olowoyeye A, Uthman OA, Smith J, Wiysonge CS, Bhutani VK, et al. Transcutaneous bilirubinometry versus total serum bilirubin measurement for newborns. Cochrane Database Syst Rev. 2023 May 9;5(5):CD012660
2. National Institute for Health and Care Excellence (NICE). Jaundice in newborn babies under 28 days [Internet]. 2023 [cited 2025 Mar 28]. Available from: https://www.nice.org.uk/guidance/cg98
3. Maisels MJ, Bhutani VK, Bogen D, Newman TB, Stark AR, Watchko JF. Hyperbilirubinemia in the newborn infant ≥35 weeks' gestation: an update with clarifications. Pediatrics. 2009 Oct;124(4):1193–8.
4. Srinivas GL, Cuff CD, Ebeling MD, McElligott JT. Transcutaneous bilirubinometry is a reliably conservative method of assessing neonatal jaundice. J Matern Fetal Neonatal Med. 2016;29(16):2635–9.
5. McClean S, Baerg K, Smith-Fehr J, Szafron M. Cost savings with transcutaneous screening versus total serum bilirubin measurement for newborn jaundice in hospital and community settings: a cost-minimization analysis. CMAJ Open. 2018;6(3):E285–91.

6. Nagar G, Vandermeer B, Campbell S, Kumar M. Effect of phototherapy on the reliability of transcutaneous bilirubin devices in term and near-term infants: a systematic review and meta-analysis. Neonatology. 2016;109(3):203–12.
7. Jackson GL, Saumur M, Chandwani V, Engle WD. Evaluation of early transcutaneous bilirubinometry to predict subsequent hyperbilirubinemia in neonates admitted to a well-baby nursery. Am J Perinatol. 2015;32(10):944–51.
8. Taylor JA, Burgos AE, Flaherman V, Chung EK, Simpson EA, Goyal NK, et al. Discrepancies between transcutaneous and serum bilirubin measurements. Pediatrics. 2015;135(2):224–31.
9. Wainer S, Parmar SM, Allegro D, Rabi Y, Lyon ME. Impact of a transcutaneous bilirubinometry program on resource utilization and severe hyperbilirubinemia. Pediatrics. 2012 Jan;129(1):77–86.
10. Dam-Vervloet AJ, Morsink CF, Krommendijk ME, Nijholt IM, van Straaten HLM, Poot L, et al. Skin color influences transcutaneous bilirubin measurements: a systematic in vitro evaluation. Pediatr Res. 2024. https://doi.org/10.1038/s41390-024-03081-y
11. Kulkarni Y. 1658 Transcutaneous bilirubin monitoring clinical pathway further reduces severity of hyperbilirubinaemia at readmission of healthy term jaundiced babies. Arch Dis Child. 2021;106:A447–8.
12. Conceição CM, Dornaus MF, Portella MA, Deutsch AD, Rebello CM. Influence of assessment site in measuring transcutaneous bilirubin. Einstein (Sao Paulo). 2014;12(1):11–5.
13. Olds C, Oghalai JS. Audiologic impairment associated with bilirubin-induced neurologic damage. Semin Fetal Neonatal Med. 2015 Feb;20(1):42–6.
14. Gamaleldin R, Iskander I, Seoud I, Aboraya H, Aravkin A, Sampson P, et al. Risk factors for neurotoxicity in newborns with severe neonatal hyperbilirubinemia. Pediatrics. 2011 Oct;128(4):e925–31.
15. NSW Health 2016. Neonatal Jaundice - Identification and management in neonates ≥32 weeks gestation GL2016_027. https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/GL2016_027.pdf3

4 ABORIGINAL HEALTH IMPACT STATEMENT DOCUMENTATION

- Considerations for culturally safe and appropriate care provision have been made in the development of this Business Rule and will be accounted for in its implementation.
- When clinical risks are identified for an Aboriginal and/or Torres Strait Islander woman or family, they may require additional supports. This may include Aboriginal health professionals such as Aboriginal liaison officers, health workers or other culturally specific services
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5 CULTURAL SUPPORT

- For a Culturally and Linguistically Diverse CALD woman, notify the nominated cross-cultural health worker during Monday to Friday business hours
- If the woman is from a non-English speaking background, call the interpreter service: NSW Ministry of Health Policy Directive PD2017_044-Interpreters Standard Procedures for Working with Health Care Interpreters.

6 NATIONAL STANDARDS

- Standard 1 Clinical Governance
- Standard 3 Preventing and Controlling Infections
- Standard 5 Comprehensive Care
- Standard 6 Communicating for Safety
- Standard 7 Blood Management
- Standard 8 Recognising and Responding to Acute Deterioration

7 REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
20.6.2017	1	J Smyth (Neonatologist), K Nanthakumar (Medical officer)
1.4.2025 1.5.2025	2	K Javier (Fellow) Endorsed NCC CBR Committee
23.6.2025	2	RHW BRGC

Appendix 1

Performing Daily Operational Light calibration on Draeger JM-105:

The light output of the device should be checked once daily as follows to ascertain the meter light output is within range.

- Remove the Jaundice Meter JM-105 from the docking station.
- Switch on the power.
- Select CHECKER and select OK to save selection.
- Open the checker lid on the charging unit.
- When the green READY light illuminates, place the tip of the Jaundice Meter perpendicular on the
- reading checker circle. Press down until you hear a click.
- The display screen shows the “L” (long), “S” (short), and Delta values. The meter must read within
- the reference values posted under the checker lid. If so, the unit is ready to use. If not, clean the
- tip and repeat. If values are still out of range, do not use the unit (contact biomed)

Configuring the JM-105:

- Press the power switch on.
- If you want to change your file storage option, configure the device as desired by selecting CONFIG > MEMORY > OK > your desired setting (OFF, MEM ONLY, or LINK ON) > OK. If not, go to next step.
- Press the MENU button to exit the CONFIG screen.
- To determine whether or not you want to average your measurements and how many measurements you want to take.
- Configure the device as desired by selecting CONFIG > AVERAGE > OK > your desired setting
- (SINGLE through 5 TIMES) > OK.