NEWBORN PULSE OXIMETRY MEASUREMENT

PRACTICE GUIDELINE

DOCUMENT SUMMARY/KEY POINTS

This guideline is to be used as a guide for non-tertiary neonatal care centres who wish to develop their own guidelines to support the care of newborns born within their Local Health District (LHD).

Thanks to Koert de Waal, Srinivas Bolisetty, Adam Buckmaster, Martin Kluckow and Nick Evans for their time and effort in developing this guideline on behalf of the NSW Pregnancy and newborn Services Network (PSN)

CHANGE SUMMARY

- Title changed to Newborn from Neonatal
- Consistent use of newborn in text
- Updated references
- Some rewording within the document

READ ACKNOWLEDGEMENT

Approved by:	PSN Neonatal Clinicians	
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1 Introduction

Pulse oximetry is a well-established, accurate, non-invasive test for objective quantification of hypoxaemia[1]. There is a significant body of evidence that pulse oximetry screening in apparently healthy newborn infants can improve detection of medical problems including critical congenital heart disease and other pathology needing medical intervention, with the potential for improved outcome of newborns affected.

The NSW Pregnancy and Newborn Services Network (PSN) recommends pulse oximetry as part of routine assessment of newborn wellbeing. A Consensus Workgroup made recommendations for a standardised approach to screening and referral/follow up[2,3].

This guideline is a summary of the recommendations (Risk Rating: Grade 3, Level of Evidence: Class 1, Level B)

The PSN acknowledges that variations to the recommendations are possible (e.g. measuring foot *and* hand) without compromising outcomes.

2 Equipment

Use a motion-tolerant pulse oximeter that reports functional oxygen saturation and is approved by the Therapeutic Goods Administration for use in newborns.

For cost effectiveness, use a reusable probe where possible, with appropriate cleaning between patients.

3 Timing of measurement

Screening should occur before discharge, but no later than 48 hours of life, to optimise the window of opportunity for early intervention[2,3]. Early screening (between 4 and 24 hours of life) will increase the false positive rate for critical congenital heart disease, but can identify newborns with other hypoxaemic pathology requiring medical intervention.

The PSN recommends early screening (4-24 hours of age) but screening between 24 and 48 hours of age is acceptable.

4 Procedure and cut-offs[4,5]

Attach the pulse oximeter probe to the baby's foot. Attaching the probe with tape (e.g. Coban©) will improve signal acquisition as long as care is taken that the tape is not applied too tightly to restrict perfusion. Do not attempt to hold the probe in place manually. Wait until a constant SpO2 is displayed, this can take up to 2 minutes.

A SpO_2 of 95% or higher is considered a pass. A SpO_2 below 95% indicates hypoxaemia and is considered a fail.

A failed screening test should trigger further review.

For saturations between 90 and 94%, physical examination by the midwife or doctor should take place with emphasis on breathing and the cardiovascular system. If this examination is normal, repeat the pulse oximetry screening within 3 hours.

If the SpO_2 is still below 95% on repeat screen, refer the newborn to paediatric services using local escalation pathways for review and consultation.

Any SpO_2 less than 90% at any time needs immediate referral to paediatric services and increased monitoring until a cause for the significant hypoxaemia is identified, even if the newborn shows no physical abnormalities.

5 Documentation

Record results of the pulse oximetry screening (pass/fail) in the newborn's Personal Health Record, the newborn's medical record and in an electronic obstetric outcome database, if available (eg. ObstetriX©)

6 Referral to paediatric services

For referral to paediatric services, use local pathways for review and consultation. At referral, a complete clinical evaluation by the most experienced medical practitioner is warranted.

The differential diagnosis of hypoxaemia includes:

- respiratory conditions: e.g. transient tachypnoea of the newborn, pneumothorax, respiratory distress syndrome, pulmonary hypertension
- congenital heart disease
- infection
- central hypoventilation
- anaemia
- metabolic disorders
- other congenital anomalies and syndromes.

Physical examination should include blood pressure measurements and pre and post-ductal (right hand and foot) pulse oximetry.

Consider additional tests (e.g. chest X-ray, infection markers) in each individual case. Transient tachypnoea of the newborn is a common neonatal condition with transient (usually mild) hypoxemia.

If pulse oximetry screening was performed before 24 hours of life, consider repeating the test after 24 hours of life, and/or placing the newborn on continuous pulse oximetry monitoring until 24 hours of age.

7 Referral to paediatric cardiology services

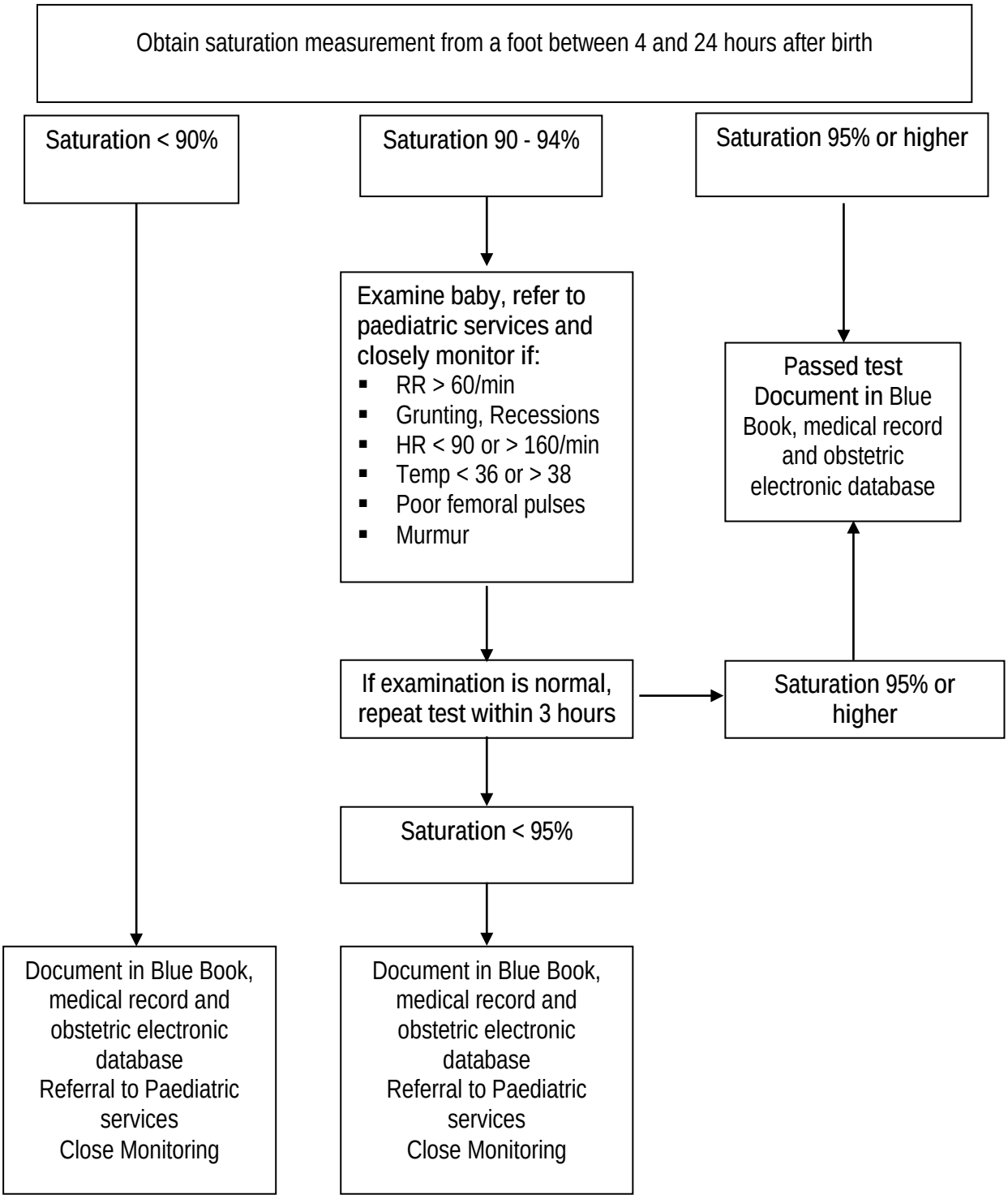
In the absence of other findings to explain persistent hypoxaemia, a comprehensive echocardiogram should exclude congenital heart disease.

Consultation with a paediatric cardiologist (locally or via the NSW Newborn and paediatric Emergency Transport Service (NETS)) is warranted to discuss further management and timing of an echocardiogram, and if needed, discuss transport to a centre where an echocardiogram can be performed. http://www.nets.health.nsw.gov.au

8 Parent information

Pulse oximetry screening is recommended as part of the assessment of general wellbeing of newborn infants. No specific detailed parent information is required. Information regarding the use of pulse oximetry can be incorporated in general admission information, where other items such as the baby check are explained.

Clinical Flow diagram: Pulse Oximetry Screening



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1. Frank LH, Bradshaw E, Beckman R, Mahle WT, Martin GR. Critical Congenital Heart Disease Screening Using Pulse Oximetry. J Pediatr. 2013;162(3):445–453

2. Mahle WT, Newburger JW, Matherne GP, Smith FC, Hoke TR, et al. American Heart Association Congenital Heart Defects Committee of the Council on Cardiovascular Disease in the Young, Council on Cardiovascular Nursing, and Interdisciplinary Council on Quality of Care and Outcomes Research; American Academy of Pediatrics Section on Cardiology and Cardiac Surgery, and Committee on Fetus and Newborn. Role of pulse oximetry in examining newborns for congenital heart disease: a scientific statement from the American Heart Association and American Academy of Pediatrics. Circulation 2009;120(5):447-58

3. Mahle, WT, Martin GR, Beekman RH 3rd, Morrow WR; Section on Cardiology and Cardiac Surgery Executive Committee. Endorsement of Health and Human Services recommendation for pulse oximetry screening for critical congenital heart disease. *Pediatrics* 2012;129(1):190-2

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5. Thangaratinam S, Brown K, Zamora J, Khan KS, Ewer AK. Pulse oximetry screening for critical congenital heart defects in asymptomatic newborn babies: a systematic review and meta-analysis. Lancet 2012;379(9835):2459-64

APPENDIX: Guideline Development Process and Working Group Membership

A working group developed and designed the initial draft guideline based on current evidence

JHH:	Dr Koert de Waal
RHW:	Dr Srinivas Bolisetty
Gosford:	Dr Adam Buckmaster
RNSH:	Dr Martin Kluckow
RPAH:	A/Prof Nick Evans

A draft was distributed among representatives of all levels of care, from birth centres to neonatal intensive care, and discussed at a consensus meeting held at the Royal Hospital for Women on the 30th of May 2012.

Consensus meeting participants included midwifery, obstetrics, paediatrics, neonatology and paediatric cardiology representatives:

Canterbury Hospital:	Dr Allan Kelly
Cooma Hospital:	Ms Sandra Hedges & Ms Jenny Flaherty
Gosford Hospital:	Ms Jane Wardle
RHW:	Ms Joanne Sheils & Ms Cheryl Johnson
SCHN (CHW):	Dr Julian Ayer & Dr Gary Sholler
SCHN (SCH):	Dr Owen Jones
St George Hospital:	Dr Kylie Yates, Dr Bob Fonseca
Sutherland Hospital:	Dr Michael Plaister & Ms Gabrielle Napper
The Canberra Hospital:	Dr Hazel Carlisle
Wollongong Hospital:	Dr Susie Piper & Ms Sylvia Lees

The aim was to design a simple guideline that could be implemented uniformly in all places where babies are born. Consensus was reached on all details of the guideline.

Revised drafts were sent for review to members of PSN Committees and Advisory Groups. The comments received have been added to this final document