



PROCEDURE

SUBJECT: Cardiac Screening with Pulse Oximetry in NICU

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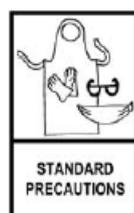
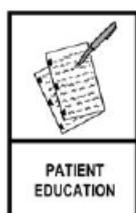
NICU Executive

KEYWORDS: cardiac, ductal, newborn, oximetry, saturation, screening

Disclaimer:

It should be noted that this document reflects what is currently regarded as a safe and appropriate approach to care. However, as in any clinical situation there may be factors that cannot be covered by a single set of guidelines, this document should be used as a guide, rather than as a complete authoritative statement of procedures to be followed in respect of each individual presentation. It does not replace the need for the application of clinical judgment to each individual presentation.

S.W.P.



RATIONALE:

Early postnatal detection of serious Congenital Heart Disease (CHD) remains an unresolved challenge. Between 50 and 75% of major CHD will not be detected on antenatal scanning and the paradox of routine clinical examination of the newborn is that you are more likely to detect minor than major CHD. It is estimated that about 75% of severe left heart obstructive lesions (e.g. coarctation, hypoplastic left heart) are not detected on clinical examination. These babies often develop symptoms after the first 3 to 4 days of life and may occur at home following early discharge from maternity hospital. In babies with ductal dependent lesions, missing a cardiac diagnosis can have severe short and long term consequences. Many serious CHD conditions produce mixing of venous and arterial blood and, in ductal dependent systemic circulations; the mixed blood supply's the lower body through the patent ductus. This will result in low oxygen saturation in the lower body so screening all babies with a lower limb oxygen saturation has been proposed as an adjunct to clinical examination as a means of improving detection of major CHD.

OUTCOMES:

Several studies of this have now been completed and these studies have recently been the subject of two systematic reviews. They concluded that, although this is not a perfect screening test, if a baby does not have oxygen saturation screening, discharge of an apparently healthy baby with undiagnosed CHD is 5.5 times more likely for cyanotic CHD and 4.4 times more likely for all serious congenital heart disease. The addition of pulse oximetry to newborn screening has the potential to diagnose CHD in an additional infant for approximately every 500 infants assessed for early screening (<24 hours) and every 2700 assessed for later screening, with a false positive rate of approximately 1-2% with early screening and 0.2% with later screening. Most of the false positives with early screening will have (transient) respiratory disease, but also more serious non cardiac abnormalities can be picked up with pulse oximetry screening. All infants with an abnormal saturation need further review.

It is important to emphasise that oxygen saturation screening does not detect all serious CHD. It must be seen as an adjunct to good clinical examination of the cardiovascular system, it does not replace it and examiners should pay particular attention to respiratory rate and effort, colour, cardiac impulses, peripheral pulses and heart sounds and murmurs on auscultation.

Risk factors for congenital heart disease are a familial history of congenital heart defects, maternal diabetes, suspected or proven congenital heart defects on antenatal scanning and dysmorphic features or other fetal abnormalities found on antenatal scanning.

INCLUSION FOR SCREENING

All newborn infants will be screened. Infants with risk factors should be evaluated for earlier referral or appointments with the paediatric cardiologists. Often appointments are already in place if abnormal antenatal findings are present.

TIMING

Ideally, all newborns should be tested between 4 and 24 hours of life. The test can be done earlier, but has a higher false positive rate. Most of these false positives are related to (transient) pulmonary disease, but all positive tests need referral to a member of the paediatric or neonatal medical staff.

In the JHCH to capture all infants the test is performed as soon as they are ready to leave the delivery suites. Saturation probes and monitors are widely available in the delivery suites. This could mean testing as early as 3-4 hours after birth. **Infants admitted to NICU require testing following admission at around 24hrs of age.**

PROCEDURE

Screening can be performed with any Massimo portable pulse oximeter with the radical SET4 algorithm or higher installed. The following should be considered;

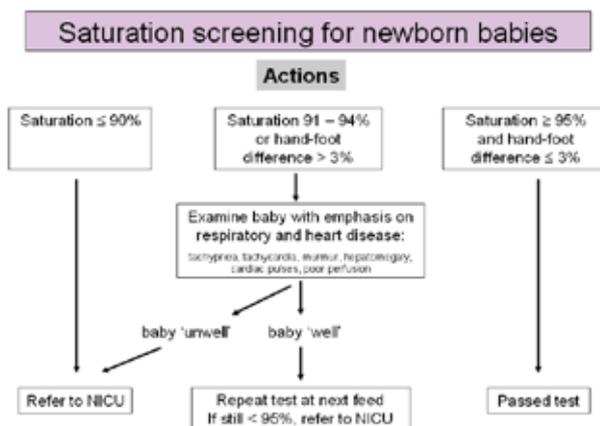
- recommended to perform the saturation measurements before the main physical examination while the baby is still quiet
- Place the photo detector portion of the probe on the fleshy portion of the outside of the infant's foot.
- Place the light emitter portion of the probe on the top of the foot.
- Place the photo detector directly opposite of light emitter, on the bottom of foot.
- Remember: The photo detector and emitter must be directly opposite each other in order to obtain an accurate reading.
- Secure the probe to the infant's foot using the adhesive or foam tape
- Allow the signal to stabilise with a good pulse signal for 30 seconds. Using high sensitivity "pickup" on the saturation monitor will ensure good traces.
- Do the same procedure for the right hand
- Record the results (see Documentation page 5)

FAILED TEST

Saturation right hand AND foot < 95% OR hand-foot difference > 3%

Actions

- If the saturation (hand or foot) is 90% or lower, refer to NICU or Pediatric registrar for further evaluation
- If the saturation is 95% or higher and the difference between hand and foot is 3% or less, the baby has passed the test
- If the saturation (hand or foot) is between 91 and 94%, and/or the difference between hand and foot is 4% or higher, the test should be repeated at the next feed.
- If the repeat test still shows saturation less than 95%, and/or the difference between hand and foot is 4% or higher, refer to NICU or Pediatric registrar for further evaluation.



It is important to realise that referral does not mean there is a congenital heart defect. Some infants with saturations between 91 and 94% will have pulmonary disease, especially if measured early (<12h). Also, the test can miss left sided heart lesions, and therefore does not pick up ALL congenital heart disease. This should be discussed with the parents.

Actions for NICU

If an infant is referred from the post natal ward or delivery suite following a failed test, repeat the clinical examination and repeat the saturation measurement.

- If the saturation is 95% or higher and the difference between hand and foot is 3% or less, the baby has passed the test

If the repeat test shows saturation < 95%, and/or the difference between hand and foot is 4% or higher, this is unlikely to be of respiratory origin and a cardiac ultrasound should take place.

- A cardiac ultrasound can be performed in the JHCH NICU (Level 2) after consultation with the cardiologists

DOCUMENTATION FOR PULSE OXIMETER SCREENING in NICU

The result is entered on a sticker placed in the Newborn Examination section of the infant's Personal Health Record (Blue Book). Entries will be dated, signed and appropriate action documented. Documentation is also important in the infant's notes-either handwritten or a sticker placed in the progress notes. Results sourced by Obstetric staff are entered into the Obstetric database and are also added to the NICUS database.

Sticker for documentation:

 Kaleidoscope <small>HUNTER CHILDRENS' HEALTH NETWORK</small>
Pulse oximetry screening passed test ? (failed test if saturation right hand and foot < 95%, and/or hand-foot difference > 3 %)
Yes / No
Date
Operator's name
Signature

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