Oxygen Saturation Screening for Congenital Heart Disease

Background

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 (eg. 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, in the era of early discharge from maternity hospital, this is often when the babies have gone home. Particularly in babies with ductal dependent lesions, the consequences can be severe. Many serious CHD conditions produce mixing of venous and arterial blood and, in ductal dependent systemic circulations, such mixed blood will be supplying 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.

Several studies of this have now been completed and these studies have recently been the subject of two systematic reviews by Valmari

Valmari’s conclusion was 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.

Thangaratinam et al concluded that summary estimate of accuracy were 63% sensitivity and 99.8% specificity and that this was a highly specific tool with a low false positive rate. One study assessed the added value of pulse oximetry to the clinical examination for detecting all CHD, with clinical examination detecting 46% and pulse oximetry detecting a further 31%, resulting in a combined sensitivity of 77% with 99.7% specificity. 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 0.2%.

The potential to prevent late presentations of critical CHD warrants the addition of oxygen saturation screening into the normal newborn examination of babies at RPA.

Protocol:

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. Details of clinical examination of the CVS can be found in the Early detection of Congenital Heart Disease protocol but to summarise, pay particular attention to:

- Respiratory rate and effort
- Colour
- Cardiac impulses
- Peripheral pulses
- Heart sounds and murmurs on auscultation.

**Oxygen saturation screening:**

All babies should have oxygen saturation screening:

- **For babies going home on early discharge from the postnatal ward,** this should be done prior to discharge by the post-natal ward midwives: Follow up screening if necessary for equivocal results will be done by MDSP who will have an oximeter for use in the community.
- **For babies going home on very early discharge from the Delivery Suite or Birth Centre:** oxygen saturation screening will be performed by MDSP on the first home visit.
- **Private babies** will be screened by their private paediatrician as part of the normal baby check examination.
- **For all other babies,** this should be done by the neonatal resident as part of the normal ‘babycheck’ routine examination.

**Procedure:**

Screening will be performed with the provided Masimo Rad5 Portable Pulse Oximeter with the following practical considerations:

- It is recommended to do this before the main examination while the baby is still quiet.
- The probe should be attached to one of the feet using Coban tape or similar.
- Switch on the Oximeter after the probe has been attached to the foot not before. This will result in much quicker signal acquisition.
- Allow the signal to stabilise with a good pulse signal for 30 seconds.
- Record the result.

**Action:**

Whatever the oxygen saturation, any baby with an abnormal cardiovascular clinical examination should be reviewed by a senior member of the neonatal medical staff, Fellow or Consultant.

1. If the oxygen saturation reading is 95% or greater and the cardiovascular examination is normal, no further action is needed.
2. If the oxygen saturation is 90-94% and the baby is going home on early discharge, the baby must be examined by a member of the neonatal medical staff prior to discharge. If that examination is normal then oxygen saturation screening should be repeated by the MDSP team who will have a saturation monitor to use in the community. Babies not being discharged to the RPA Midwifery Support Programme cannot be discharged until normal oxygen saturations are recorded. If the oxygen saturation remains below 95% beyond 72 hours, then the baby must be reviewed by a senior member of the neonatal medical staff.
3. If the oxygen saturation is 90-94% and the routine CVS examination is normal, the saturation measure must be repeated 24 hrs later until the reading is above 95%. If it
remains below 95% beyond 72 hours, then the baby must be reviewed by a senior member of the neonatal medical staff.

4. If the oxygen saturation is below 90%, then the baby must be reviewed by a senior member of the neonatal medical staff.

Indications for further cardiovascular investigations should be directed by the senior member of medical staff that examines the baby, but if echocardiography is indicated then it should be done according to the guidelines in the Echocardiography Protocol.

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**Documentation of Pulse Oximeter Screening**

**In patients**

The oxygen saturation will be documented by the RMO, midwife or private paediatrician on the RPA Newborn Care Plan (MR504) under Referrals / Follow up appointments and in the section Newborn Examination in the infant’s Personal Health Record (Blue Book). Both entries will be dated, signed and appropriate action documented.

**Outpatients**

Infants who are screened at home by the midwives in MDSP will have their initial / follow up oxygen saturation recorded in the section Newborn Examination of the infant’s Personal Health Record (Blue Book) and in the Midwifery Discharge Support Programme Care Plan (MR500A). Both entries will be dated, signed and appropriate action documented.

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**References:**


3. Valmari P. Should pulse oximetry be used to screen for congenital heart disease? *Arch Dis Child* 2007; **92**: F219-F224


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