

Pulse oximetry screening guidelines for newborn babies

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Pulse oximetry screening guidelines for newborn babies

Overview

These guidelines provide instructions on how to carry out pulse oximetry screening in newborn babies. They have been written for health practitioners involved in health assessment, screening, and treatment of newborn babies in Aotearoa New Zealand.

Pulse oximetry screening can detect hypoxaemia caused by congenital heart defects in newborn babies. Parents, whānau, and guardians of newborn babies should be offered screening if the baby is born at 35 weeks' gestation or more. Screening should take place between 2–24 hours after birth (see algorithm).

Pulse oximetry screening does not replace the newborn clinical assessment for congenital heart disease. Auscultating for murmurs, detection of clinically visible cyanosis, and palpation of pulses (femoral pulses in particular) remain an important part of the newborn and six-week examination.

Background

Congenital heart disease (CHD) is the most common group of congenital malformations, with a reported incidence of 4–10 per 1,000 live-born babies.^(1,2) CHD encompasses a variety of lesions, ranging from lesions with no functional or clinical significance to potentially life-threatening conditions. Critical congenital heart disease (CCHD) are heart defects that cause life-threatening symptoms and require intervention within the first 28 days of life.

Most critical heart defects are picked up on antenatal ultrasound screening, and some are detected at the time of the newborn physical examination. However, approximately 14 percent of babies born in Aotearoa New Zealand with CCHD are diagnosed after discharge from the hospital or maternity facility.⁽³⁾

Pulse oximetry detects low oxygen saturation levels (hypoxaemia) and has been shown to improve the early diagnosis of CCHD in newborn babies. It should be used in addition to other types of screening.

A feasibility study led by the Liggins Institute, University of Auckland, showed that: ⁽³⁾

- Pulse oximetry can help detect previously unidentified CCHD.
- In addition to detecting CCHD, pulse oximetry is a valuable tool for detecting respiratory, infectious and other diseases that cause hypoxaemia.
- Pulse oximetry is acceptable to both consumers and health care professionals.

Information sharing and consent

Parents, whānau and guardians of well newborn babies should be offered screening if the baby is born at 35 weeks' gestation or more.

Parents, whānau and guardians have the right to make an informed decision about whether to go ahead with pulse oximetry screening. Health practitioners should provide parents, whānau and guardians with full, accurate, and unbiased information about the test. Ideally, discussions will take place before the baby is born.

Test results should be documented in the newborn's clinical notes. If parents, whānau or guardians decline screening, this decision should be recorded in the maternal and newborn clinical notes.

Optimal timing of the pulse oximetry screen

These guidelines recommend screening occurs between 2 hours and 24 hours of age (see algorithm). The exact timing of the screen may depend on the birth setting.

For birth in a hospital or maternity facility, screening should be undertaken prior to discharge.

Babies should not be discharged from the hospital or maternity facility unless they have reached oxygen saturations of $\geq 95\%$.

For home births, where possible, screening should be undertaken before the midwife leaves the home.

If screening did not take place in the first 24 hours for an otherwise healthy baby, the test should be performed at the earliest possible opportunity.

Undertaking the pulse oximetry screen before 4 hours of age is associated with higher false-positive rates.⁽⁴⁾ A false-positive reading may delay discharge or transfer from hospital, and it may cause unnecessary parental anxiety. Therefore, the benefits of early screening should be balanced against the potential consequences of a higher false-positive reading. Use your professional judgement to decide when is best to administer the test.

Equipment

Motion-tolerant pulse oximeters that measure functional oxygen saturation levels are recommended. Set an averaging time of 8 seconds to mitigate against any impact from the baby's movement, which could affect the accuracy of the reading.

Reusable sensors are more cost-effective than disposable sensors. Reusable sensors need to be secured with a disposable foam wrap or adhesive tape. The wrap or tape should allow the sensor to make good contact with the skin and prevent light ingress through the skin adjacent to the sensor.

Health New Zealand | Te Whatu Ora Districts are responsible for funding equipment and consumables to support the implementation of pulse oximetry screening in every birth setting.

Steps for carrying out screening

1. Explain the procedure to parents, whānau, or guardians.
2. Obtain verbal consent to proceed with screening.
3. Aim to perform the test when the baby is awake, calm, and warm. The test can be performed during breastfeeding.
4. Place and attach the oximeter sensor onto the newborn's left or right foot (post-ductal screen).
5. Turn the monitor on.
6. Obtain an oxygen saturation reading. (Allow time to obtain a stable reading.)



Assessing the test results

- An oxygen saturation of $\geq 95\%$ indicates a pass. Document the result in the clinical/electronic notes. There is no need to complete further testing.
- If the oxygen saturation reading is $<90\%$, discuss the result with the medical team immediately and document the result and the plan of care. (Refer to the algorithm.)
- If the oxygen saturation reading is 90-94%, the result is inconclusive. Perform another test 1 to 2 hours after the first test. (Refer to the algorithm.)
- If the oxygen saturation of the second test is in the inconclusive range (90-94%), the test can be repeated for a third time 1 to 2 hours later.
- If the oxygen saturation of the third test is $<95\%$, the baby should be referred for a medical assessment. (Refer to the algorithm).
- Document each result in the clinical/electronic notes.

If you have clinical concerns at any stage of this process, immediately refer the baby to the medical team.

Management strategy if a baby does not reach oxygen saturation targets

- Refer the baby for a same-day medical assessment.
- A thorough clinical examination should be performed, as per standard paediatric procedures.
- When a baby has low oxygen saturations, pre-ductal oxygen saturation levels can help with a diagnosis. It is recommended that a pre-ductal measurement is taken as part of the diagnostic work-up and when monitoring babies with suspected cardiac disease or persistent pulmonary hypertension.
- Further investigations and/or transfer should be at the discretion of the responsible medical team.
- An echocardiogram should only be requested after consultation with the responsible paediatrician.
- Approximately two thirds of positive tests will not be attributed to congenital heart disease but may reveal alternative diagnoses.⁽⁴⁾
- Consideration should be given to respiratory, infective, and metabolic conditions, or transitional circulation in the context of very early screening.

Special considerations

Babies born at <35 weeks' gestation will generally be admitted to a newborn unit where they will be monitored as part of the standard care provided to premature babies.

On the rare occasion that a baby born at <35 weeks' gestation is admitted to a postnatal ward or transitional care unit, pulse oximetry screening should be performed.

Unwell babies born at ≥ 35 weeks' gestation who are admitted to a newborn unit do not have to be screened. These babies are often haemodynamically unstable and will have routine monitoring of oxygen saturations. It is the responsibility of the attending medical team to ensure that all babies have reached saturation targets prior to discharge from the newborn unit.

Babies receiving palliative care do not have to be screened.

If preferred, centres can offer a two-limb (pre- and post-ductal) screening strategy, with the appropriate algorithm in place.

Data collection and monitoring

Data from screening tests must be recorded and screening rates will be monitored at a local level to ensure equitable outcomes and continuous quality improvement.

Please record the following details:

1. Test completed (yes/no) (uptake)
2. Saturation level of each test
3. Date/time of each test in relation to date/time of birth
4. Test result (pass/fail)
5. Baby referred for further assessment (yes/no)
6. Test accuracy (false-positive and false-negative rates)
7. Clinical outcomes for babies who were referred
8. Ethnicity of the baby
9. Location of birth

At a national level there will be a requirement for regions to report screening rates, but this pathway is not confirmed yet. The intended pathway is for districts to provide data annually to the National Maternity Monitoring Group via the Maternity Quality and Safety Programme (MQSP) annual reports. The aim is for this pathway to be established by December 2024.

Equity

All health entities in Aotearoa New Zealand are guided by the health sector principles aimed at, among other things, improving the health sector for Māori and improving hauora Māori outcomes.

Health New Zealand | Te Whatu Ora has a responsibility to contribute to the Crown meeting its obligations under Te Tiriti o Waitangi. Health New Zealand | Te Whatu Ora Districts are responsible for funding and operationalising the recommendations outlined in these guidelines. Therefore, when implementing these guidelines, Districts are responsible for ensuring their commitments to delivering equitable services through meeting their obligations under Te Tiriti o Waitangi.

Further, the Pae Ora (Healthy Futures) Act 2022 states the health sector should be equitable, meaning babies and their parents, whānau, or guardians will have access to pulse oximetry screening, receive equitable levels of service, and as a result achieve equitable health outcomes.

Information resources

- Screening algorithm
- Data collection form
- Information sheet for parents, whānau and guardians

References

1. Prudhoe, S, Abu-Harb, M, Richmond, S, & Wren, C. (2013). Neonatal screening for critical cardiovascular anomalies using pulse oximetry. *Arch Dis Child Fetal Neonatal Ed*, 98(4), F346-350. doi:10.1136/archdischild-2012-302045
2. Ewer AK. (2014). Pulse oximetry screening for critical congenital heart defects in newborn infants: should it be routine? *Arch Dis Child Fetal Neonatal Ed*. 2014;99(1):F93-5
3. Cloete, E, Bloomfield, F H, Cassells, S A, de Laat, M W M, Sadler, L, & Gentles, T L. (2019). Newborn pulse oximetry screening in the context of a high antenatal detection rate for critical congenital heart disease. *Acta Paediatr*. doi:10.1111/apa.14946
4. Cloete, E, Gentles, T L, Webster, D R, Davidkova, S, Dixon, L A, Alsweller, J M, Bloomfield, F H, & Pulse Oximetry Screening Steering Committee. (2019). Pulse oximetry screening in a midwifery-led maternity setting with high antenatal detection of congenital heart disease. *Acta Paediatr*. doi:10.1111/apa.14934