THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

LIGGINS INSTITUTE

Pulse Oximetry Screening

NWH Annual Clinical Report Day

August 2016

Congenital heart disease

- Structural heart disease that is present at birth
- Most common group of congenital malformations
- Affects 4-10/1000 live born infants
- Leading cause of infant mortality from birth defects
- May only be recognised when cardiovascular compromise occurs

Screening strategies

- Antenatal screening
- Mid-trimester anatomy scan offered to all pregnant women
- Allows time for appropriate counseling
- Timely medical and surgical intervention

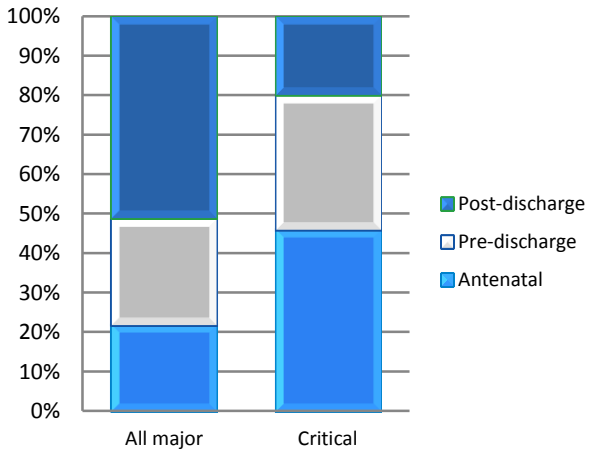
- Clinical examination
- Newborn examination
- 6 week check

CHD in NZ

Population based study

- Infants and fetuses with major CHD born or terminated: 5-year period
- Data obtained from PCCS databases, PMMRC & CYMRC

- 734 cases of major CHD
- 353 critical



- Late diagnosis associated with higher mortality risk (27% vs. 13%)

Eckersley L, Sadler L, Parry E, Finucane K, Gentles TL. Timing of diagnosis affects mortality in critical congenital heart disease. Arch Dis Child. 2016;101(6):516-20.

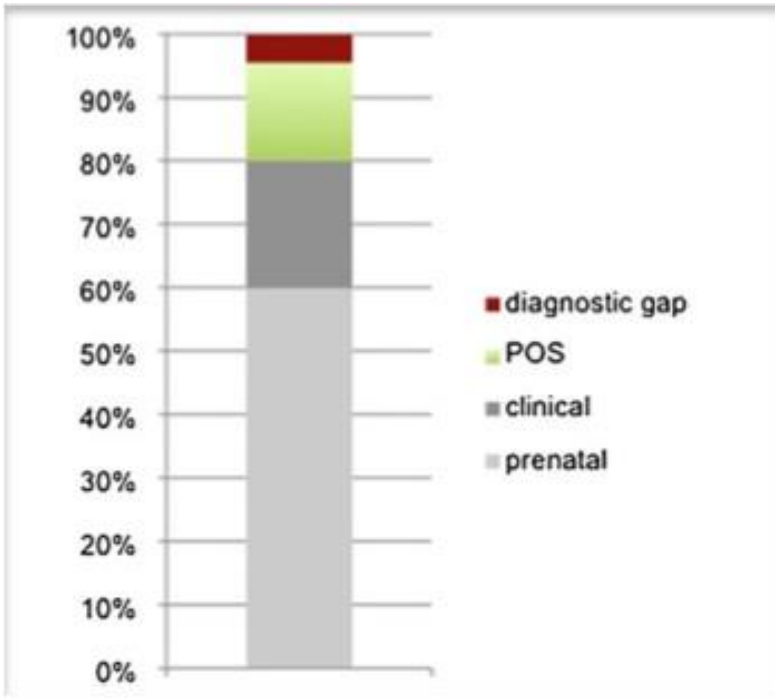
Key to better outcomes:

Early detection

- Allows the possibility of intervention
- Can influence the natural history of the condition

Pulse oximetry as a screening tool

- Identify hypoxaemic newborns
- Majority of infants with critical CHD will have a degree of hypoxaemia
- Enables early detection of the most severe cardiac defects
- Will also detect other pathologies
- Has been used as a screening tool for the detection of CHD for more than a decade



Riede FT, Worner C, Dahnert I, Mockel A, Kostelka M, Schneider P. Effectiveness of neonatal pulse oximetry screening for detection of critical congenital heart disease in daily clinical routine--results from a prospective multicenter study. Eur J Pediatr. 2010;169(8):975-81.

de-Wahl Granelli A, Wennergren M, Sandberg K, Mellander M, Bejlum C, Inganas L, et al. Impact of pulse oximetry screening on the detection of duct dependent congenital heart disease: a Swedish prospective screening study in 39,821 newborns. BMJ. 2009;338:a3037.

Turska Kmiec A, Borszewska Kornacka MK, Blaz W, Kawalec W, Zuk M. Early screening for critical congenital heart defects in asymptomatic newborns in Mazovia province: experience of the POLKARD pulse oximetry programme 2006-2008 in Poland. Kardiol Pol. 2012;70(4):370-6.

Ewer AK, Middleton LJ, Furmston AT, Bhoyar A, Daniels JP, Thangaratinam S, et al. Pulse oximetry screening for congenital heart defects in newborn infants (PulseOx): a test accuracy study. Lancet. 2011;378(9793):785-94.

Zhao QM, Ma XJ, Ge XL, Liu F, Yan WL, Wu L, et al. Pulse oximetry with clinical assessment to screen for congenital heart disease in neonates in China: a prospective study. Lancet. 2014;384(9945):747-54.

- Added to the Recommended Uniform Screening Panel in September 2011
- Endorsed by the AAP in 2012
- Majority of states passed legislation **mandating** pulse oximetry screening
- Several achieved full voluntary implementation
- >80% screened

- In 2014 the UK National Screening Committee recommended piloting pulse oximetry screening across England
- **Feasible on national level?**
- Commenced July 2015

- *Ad hoc* implementation since 2004
- Implementation rates 2013: Finland 97%, Sweden 91%, Norway 90%
- Now have coverage close to **100%**
- Ongoing efforts to implement unify screening guidelines

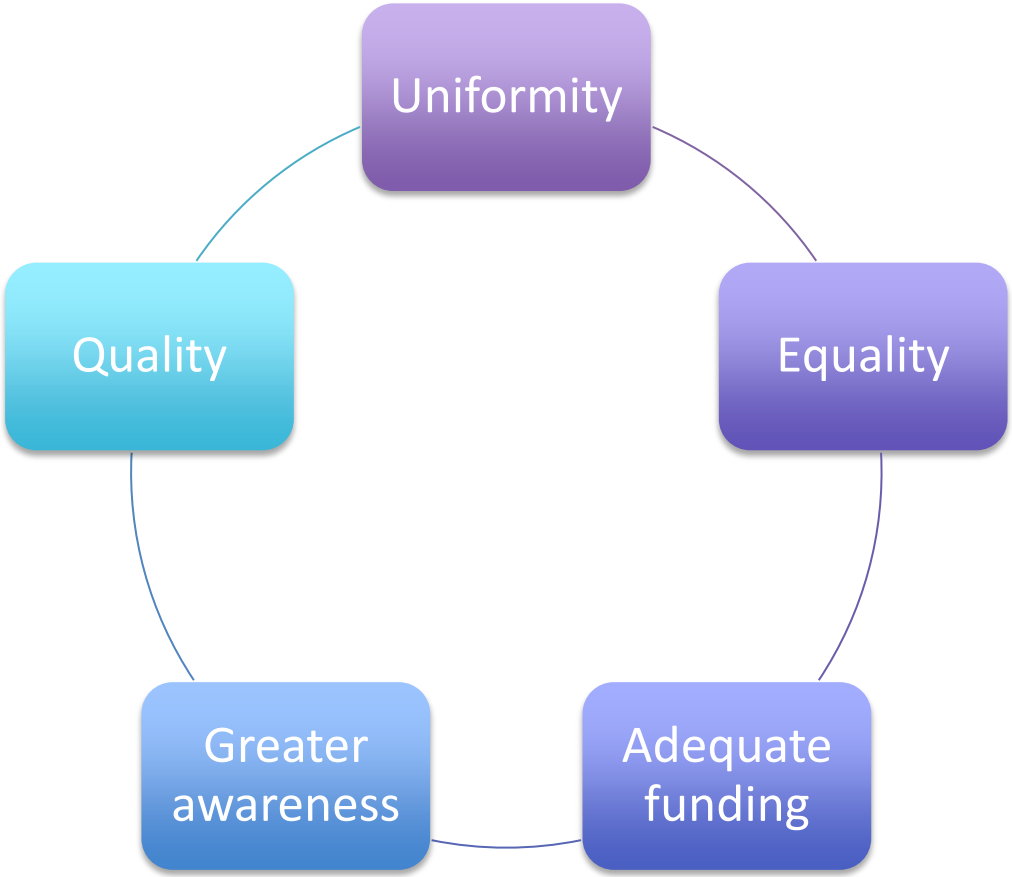
- Large number of home births in the Netherlands
- 33% of all deliveries supervised by community-based midwives
- Allow screening from 1 hour of age
- **Screening rate of 90% achieved in the community**

- Successful implementation at various hospitals across Australia
- ANZNN survey 2013: 11/24 tertiary hospitals were screening

- Capital and Coast DHB – screening introduced in 2013
- Currently supporting Wairarapa DHB to introduce screening
- Hawkes Bay – screening introduced in 2015
- Dunedin – screening introduced in 2016
- Palmerston North – currently working towards implementation

- No reports in the literature of screening practices and outcomes

A nationally led programme will be superior to hospital-led initiatives



Screening criteria

- The condition is an important health problem ✓
- There is an effective and accessible treatment ✓
- There is a suitable test ✓
- The potential benefits from screening should outweigh the potential harm ✓

Is it feasible to implement a uniform nationwide screening programme in the NZ maternity setting?

- Is our health care system capable of supporting all elements of the screening pathway?
- Will a pulse oximetry screening programme be clinically, socially and ethically acceptable to health care professionals and the public?
- Will it be cost-effective?

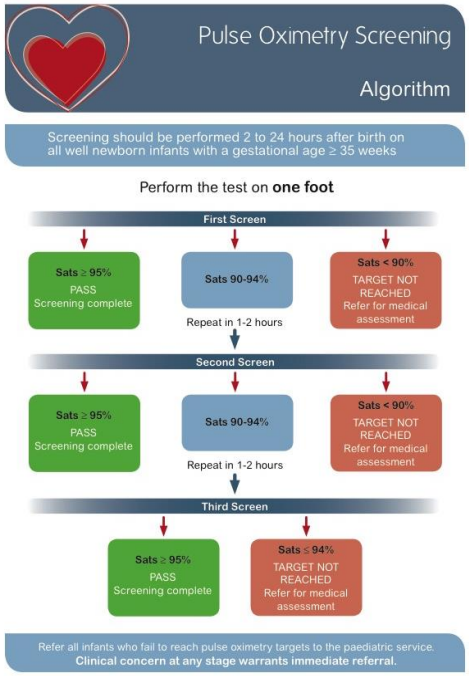
Screening at the ADHB

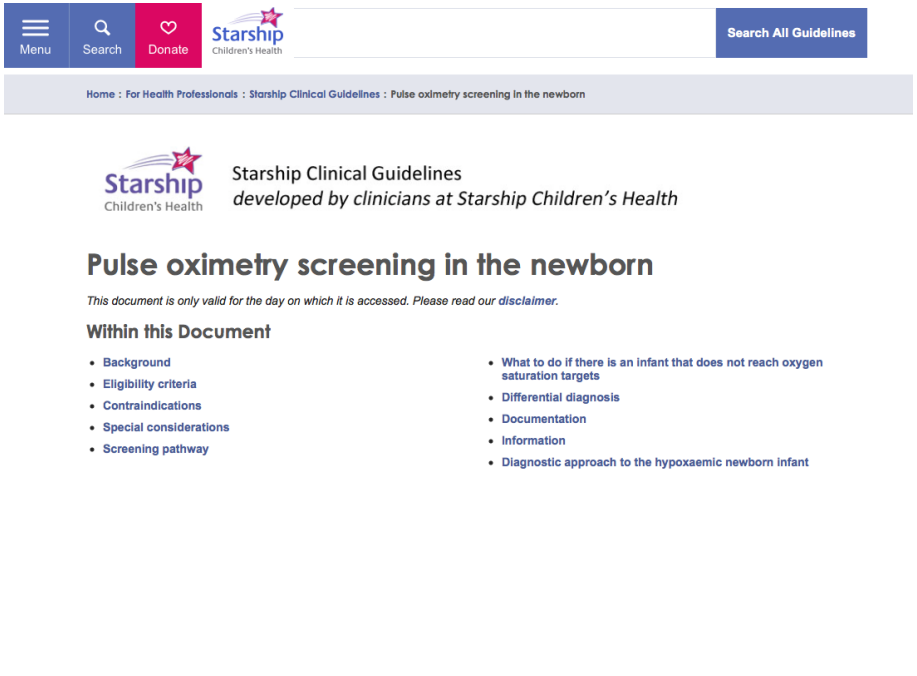
- One of three participating centres (CMDHB & Lakes)
- Pilot study to assess feasibility of a nationwide screening programme in the NZ maternity setting

Pre-implementation

Resource development

- Guidelines
- Information/Education tools
- Videos
- Parent information





Pre-implementation

Education/Raising awareness

- Training sessions
- Midwifery study days
- Grand Round presentations
- Clinical governance meetings
- Survey
- Media

The construction cost of $15.3 million is jointly funded by the Ministry of Health and Capital & Coast CDHB. The first sod was turned in 2014 by Health Minister Jonathan Coleman.

General Manager of Mental Health, Addictions, and Intellectual Disability Services 3 DHB, Nigel Fairley, says the unit will provide a safe environment with onsite 24 hour-a-day care from a specialist multi-disciplinary team.

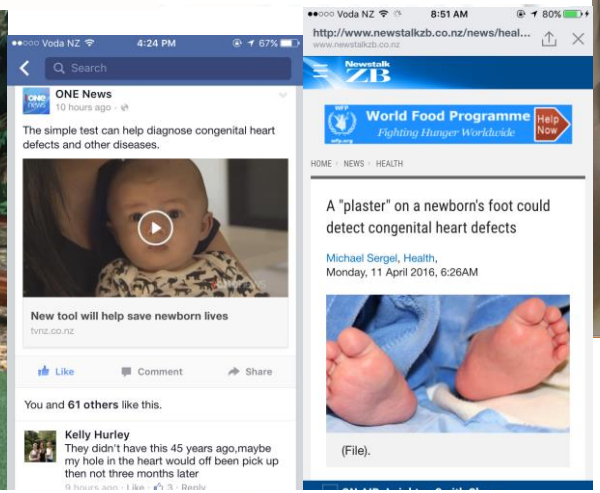
"There will be an emphasis on Māori cultural therapeutic practices to meet the intention of a bicultural service. There is also a strong educational component integrated into the service programme."

Starship Foundation funds life-saving pulse oximetry trial for early detection of congenital heart defects in newborns

National children's hospital Starship, in conjunction with the Liggins Institute, University of Auckland, launched a pilot programme in April that has the potential to save lives and improve health outcomes for New Zealand babies born with congenital heart defects.

With significant funding provided by the Starship Foundation, the pilot introduces pulse oximetry screening of newborn babies as a tool to help detect critical congenital heart defects (CHD), the most common birth defect. Starship is the only hospital in New Zealand with on-site paediatric cardiac specialist services and facilities for paediatric cardiac intervention.

Pulse Oximetry Screening



Supporting Starship Paediatric Research

Research can save lives. It can also significantly improve the quality of life for sick and vulnerable children. In fact research is the key to tackling some of the critical health challenges affecting New Zealand today and that's why Starship Foundation wants to fund even more research.

We are proud to support Starship, New Zealand's largest paediatric clinical research facility.

Here's a snapshot of just two of Starship's current and past research projects:

Pulse Oximetry Screen for detection of critical congenital heart disease in new-borns

Starship Foundation is currently funding a pilot programme for pulse oximetry screening of new-born babies to detect critical congenital heart disease (CHD) in a timely manner. Early detection of congenital heart disease has the ability to save the lives of babies and or greatly reduce the impact on a child's quality of life should the condition go undiagnosed for any length of time. The foundation has funded the equipment and other resources necessary to carry out this pilot programme currently taking place at Auckland City Hospital.

Early identification and management of child abuse

Thanks to financial support from the Starship Foundation and its supporters, Starship lead clinicians have led research into the identification and management of child abuse. Due to Starship

National Women's Health Auckland

Joined 4 years ago · Auckland, New Zealand

15 Videos · 4 Likes · 7 Following · 0 Groups · 2 Channels · 0 Albums

Follow Message

At National Women's Health in Auckland City Hospital, we provide high quality health services for women who need maternity, newborn, gynaecology and fertility care. Our services are provided on two sites - Level 9 and 10 of Auckland City Hospital (ACH) in Grafton and the Greenlane Clinical Centre (GLCC) in Greenlane, Auckland, New Zealand.

Part of our role as New Zealand's leading

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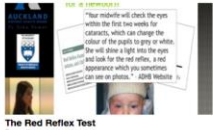
The Red Reflex Test
5 months ago

Huge news for tiny hearts

RESEARCH UPDATE

We are delighted to announce that Starship in collaboration with the Liggins Institute, will shortly be launching a new pilot programme that has the potential to save lives and improve treatment for babies born with Congenital Heart Defects (CHD).

A range of congenital heart defects affect up to 600 new-borns in New Zealand a year, many of whom need immediate life-saving surgery. The longer it takes to diagnose their condition, the more dangerous the situation becomes, and the higher the risk of long term effects, so it's critical to assess babies as soon as possible.

This pilot will use a technique called Pulse Oximetry Screening for ALL newborn babies at Starship, other birthing units and in the community, in order to detect critical congenital heart defects as early as possible. And while a Pulse Oximeter might sound like a big scary machine, it's actually just a small Band-Aid-like wrap that's placed around the baby's foot. It contains a light sensor that measures the oxygen saturation of the babies blood – a simple, non-invasive test that can be completed in a matter of minutes.

The study is being funded by some of Starship Foundation's big-hearted supporters, and it's just one of many life-saving studies on the go at the moment – with many more planned to get underway soon.

So to all you wonderful supporters who have given to support Starship children's medical research, or will help support this amazing work into the future, we want to send you out a huge thank you for everything you do.

Jesse (pictured with his dad Eugene) was just 12 hours old when he was rushed from Birthcare to Starship with critically low blood oxygen levels caused by a heart defect. The new test, now being trialled, will detect most critical congenital heart defects soon after birth, improving health outcomes for other children like Jesse.

Screening at the ADHB

- Commenced April 2016
- Support from student & nurse 5 days a week
- Ongoing support from nurse

Two significant detections

- Transposition of the great arteries
- Congenital pneumonia

Audit (April to July)

- 2029 babies were eligible for screening
- 1173 (57.8%) screened

	Total births	Number screened	Percentage screened
DHB	489	332	67.8%
Self-employed midwife	1022	498	48.7%
Private obstetrician	518	343	66.2%

Quality

- Documentation

- Many forms not placed in trays: no opportunity to capture data

- 30% of forms have missing data fields
- Important information not gathered

PULSE OXIMETRY SCREENING - FORM A - SCREENING RECORD

AUCKLAND DISTRICT HEALTH BOARD
Te Toka Tumai

Screening Record (Form A)

MUST ATTACH PATIENT LABEL HERE

SURNAME: _____ NHI: _____

FIRST NAMES: _____ DOB: _____

Please ensure you attach the correct visit patient label

Office Use: Study ID	1	6	9	1	8	0	•					

Pulse Oximetry Screening

A3. Screening Results

A3.1. First Screen

A3.1.1. Performed at Date (dd-mm-yyyy)											Time (24h - min)				Location (circle one)				
							2	0					h			Delivery Suite	Postnatal Ward	Birthing Facility	NICU/ SCBU	Home

A3.1.2. Infant's status (tick one)							
Asleep		Breastfeeding		Awake & settled		Awake & unsettled	

A3.1.3 Saturation foot	%

Result	Tick One	Action
Pass		No further testing required
Inconclusive		Repeat screening in 1-2 hours
Target not reached		Contact a newborn health care provider

A3.1.4 Approximate duration of screening process:		min

A3.2. Second Screen

A3.2.1. Performed at Date (dd-mm-yyyy)											Time (24h - min)				Location (circle one)				
							2	0					h			Delivery Suite	Postnatal Ward	Birthing Facility	NICU/ SCBU	Home

A3.2.2. Infant's status (tick one)							
Asleep		Breastfeeding		Awake & settled		Awake & unsettled	

A3.2.3 Saturation foot	%

Result	Tick One	Action
Pass		No further testing required
Inconclusive		Repeat screening in 1-2 hours
Target not reached		Contact a newborn health care provider

A3.3. Third Screen

A3.3.1. Performed at Date (dd-mm-yyyy)											Time (24h - min)				Location (circle one)				
							2	0					h			Delivery Suite	Postnatal Ward	Birthing Facility	NICU/ SCBU	Home

A3.3.2. Infant's status (tick one)							
Asleep		Breastfeeding		Awake & settled		Awake & unsettled	

A3.3.3 Saturation foot	%

Result	Tick One	Action
Pass		No further testing required
Target not reached		Contact a newborn health care provider

CR9149

Where to next?

- Aim for higher screening rates
- Quality improvement
- Further education and training required?
- Please give us your feedback: **surveys**

pulseox@adhb.govt.nz

Thank you

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NEW ZEALAND

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Clinical Excellence Through Research and Education

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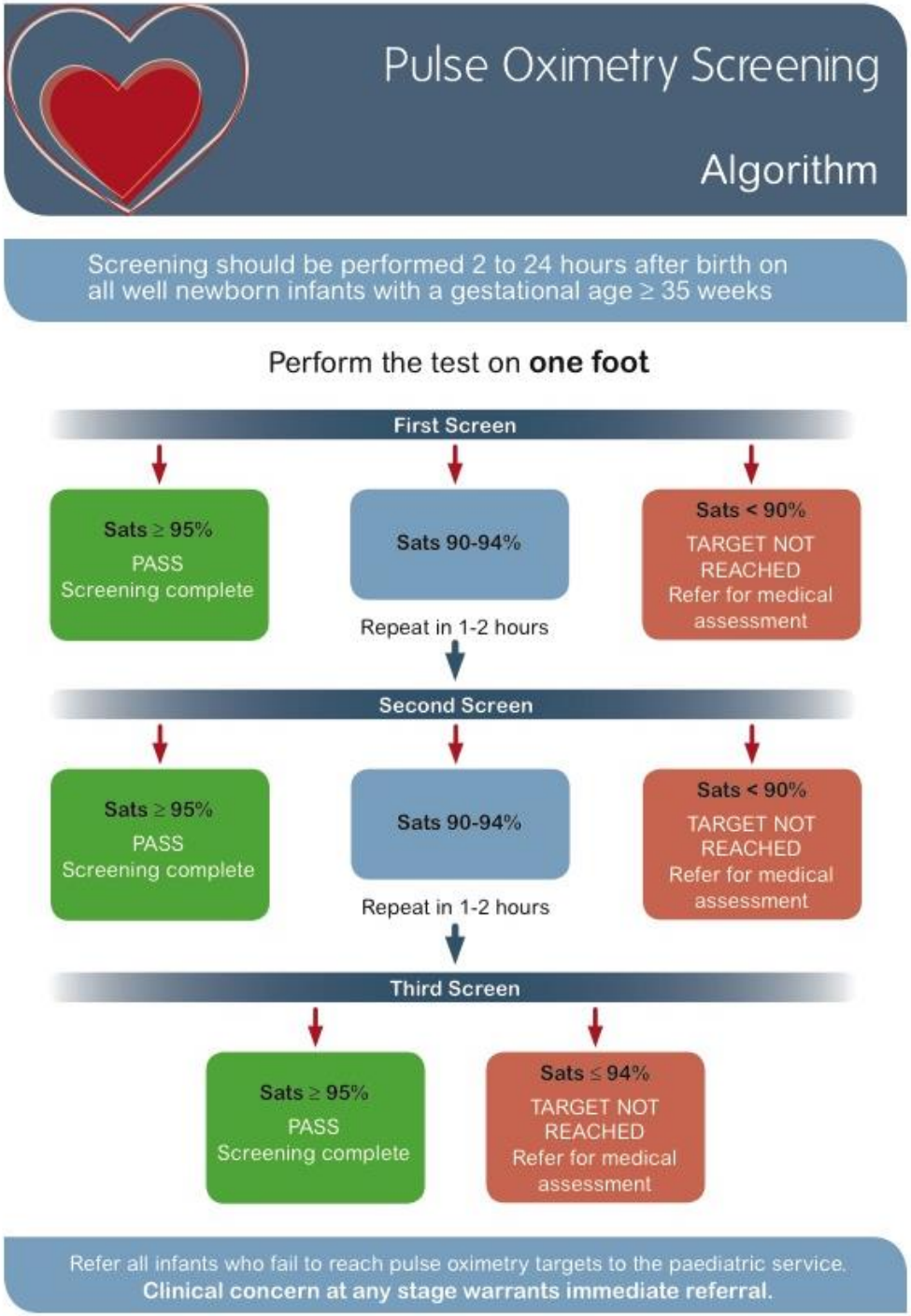
Pulse Oximetry Screening
Algorithm
Screening should be performed 2 to 24 hours after birth on all well newborn infants with a gestational age ≥ 35 weeks
Perform the test on one foot
First Screen
Sats ≥ 95%
PASS
Screening complete
Sats 90-94%
Repeat in 1-2 hours
Sats < 90%
TARGET NOT REACHED
Refer for medical assessment
Second Screen
Sats ≥ 95%
PASS
Screening complete
Sats 90-94%
Repeat in 1-2 hours
Sats < 90%
TARGET NOT REACHED
Refer for medical assessment
Third Screen
Sats ≥ 95%
PASS
Screening complete
Sats ≤ 94%
TARGET NOT REACHED
Refer for medical assessment
Refer all infants who fail to reach pulse oximetry targets to the paediatric service.
Clinical concern at any stage warrants immediate referral.