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
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%)

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


• 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

<table>
<thead>
<tr>
<th>Location</th>
<th>Year of Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital and Coast DHB</td>
<td>2013</td>
</tr>
<tr>
<td>Currently supporting Wairarapa DHB to introduce screening</td>
<td></td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>2015</td>
</tr>
<tr>
<td>Dunedin</td>
<td>2016</td>
</tr>
<tr>
<td>Palmerston North</td>
<td>Currently working towards implementation</td>
</tr>
</tbody>
</table>

- 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 $153 million is jointly funded by the Ministry of Health and Capital & Coast DHB. The first soil was turned in 2014 by Health Minister Jonathan Coleman.

General Manager of Mental Health, Addictions, and Intellectual Disability Services S DHB, Nigel Fairley, says the unit will provide a safe environment with onsite 24-hour-day care from a specialist multidisciplinary 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 Liggett 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 detect critical congenital heart defects (CHD), the most common birth defect. Starship is the only hospital in New Zealand with on-site pediatric cardiac specialist services and facilities for pediatric cardiac intervention.

**Huge news for tiny hearts**

We are delighted to announce that Starship in collaboration with the Liggett 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 6000 newborns 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 (Pulse Oximetry for newborns at Starship, either birthing units and in the community, in order to detect critical congenital heart defects as early as possible. And whilst 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 baby’s 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 key national 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.
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

<table>
<thead>
<tr>
<th></th>
<th>Total births</th>
<th>Number screened</th>
<th>Percentage screened</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHB</td>
<td>489</td>
<td>332</td>
<td>67.8%</td>
</tr>
<tr>
<td>Self-employed midwife</td>
<td>1022</td>
<td>498</td>
<td>48.7%</td>
</tr>
<tr>
<td>Private obstetrician</td>
<td>518</td>
<td>343</td>
<td>66.2%</td>
</tr>
</tbody>
</table>
Quality

- Documentation

- Many forms not placed in trays: no opportunity to capture data
- 30% of forms have missing data fields
- Important information not gathered
### A3. Screening Results

#### A3.1. First Screen

<table>
<thead>
<tr>
<th>A3.1.1. Performed at Date (dd-mm-yyyy)</th>
<th>Time (24h - min)</th>
<th>Location (circle one)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 0</td>
<td></td>
</tr>
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**A3.1.2. Infant's status (tick one)**

- Asleep
- Breastfeeding
- Awake & settled
- Awake & unsettled

**A3.1.3. Saturation foot (%)**

<table>
<thead>
<tr>
<th>Result</th>
<th>Tick One</th>
<th>Action</th>
</tr>
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<tbody>
<tr>
<td>Pass</td>
<td></td>
<td>No further testing required</td>
</tr>
<tr>
<td>Inconclusive</td>
<td></td>
<td>Repeat screening in 1-2 hours</td>
</tr>
<tr>
<td>Target not reached</td>
<td></td>
<td>Contact a newborn health care provider</td>
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**A3.1.4. Approximate duration of screening process:** min

#### A3.2. Second Screen

<table>
<thead>
<tr>
<th>A3.2.1. Performed at Date (dd-mm-yyyy)</th>
<th>Time (24h - min)</th>
<th>Location (circle one)</th>
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<td>1 0</td>
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**A3.2.2. Infant's status (tick one)**

- Asleep
- Breastfeeding
- Awake & settled
- Awake & unsettled

**A3.2.3. Saturation foot (%)**

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#### A3.3. Third Screen

<table>
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<tr>
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<th>Time (24h - min)</th>
<th>Location (circle one)</th>
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<tr>
<td></td>
<td>1 0</td>
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**A3.3.2. Infant's status (tick one)**

- Asleep
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- Awake & unsettled

**A3.3.3. Saturation foot (%)**

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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
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.