Early Detection of Health and Developmental Problems in Young Children

Newborn Hearing Screening in Victoria

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VIHSP Director

What is screening?

• “…a strategy used in a population to detect a disease in individuals without signs or symptoms of that disease.”
• “The intention of screening is to identify disease in a community early…”

http://en.wikipedia.org/wiki/Screening_(medicine)
 Accessed March 7 2010

Screening matrix

<table>
<thead>
<tr>
<th>DIAGNOSTIC RESULT</th>
<th>SCREEN RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSITIVE</td>
<td>True Positive “Hit”</td>
</tr>
<tr>
<td>NEGATIVE</td>
<td>False Positive</td>
</tr>
</tbody>
</table>

A ‘positive’ screening test = increased likelihood of having the condition; further investigation required to determine whether disease or condition is present.

Evaluating screening tests

<table>
<thead>
<tr>
<th>Property</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>True positive rate</td>
<td>higher = better</td>
</tr>
<tr>
<td>True negative rate</td>
<td>higher = better</td>
</tr>
<tr>
<td>False positive rate</td>
<td>lower = better</td>
</tr>
<tr>
<td>False negative rate</td>
<td>lower = better</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>higher = better</td>
</tr>
<tr>
<td>Specificity</td>
<td>higher = better</td>
</tr>
</tbody>
</table>

All screening tests can do harm – overdiagnosis, false sense of security

Principles of Early Disease Detection (WHO, 1968)

Condition
• The condition should be an important health problem.
• There should be a recognisable latent or early symptomatic stage.
• The natural history of the condition, including development from latent to declared disease should be adequately understood.

Test
• There should be a suitable test or examination.
• The test should be acceptable to the population.

Treatment
• There should be an accepted treatment for patients with recognised disease.

Screening Program
• There should be an agreed policy on whom to treat as patients.
• Facilities for diagnosis and treatment should be available.
• The cost of case-findings (including diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole.
• Case-findings should be a continuing process and not a ‘once and for all’ project.

Principles & characteristics of screening

• screening test should be acceptable to the population
• follow-up must be available after a positive result on a screen (i.e. diagnostic services)
• there must be an agreed policy on who to treat
• condition being screened for should be an important health problem
• a screening test is not diagnostic: it is designed to identify those who are AT HIGHER RISK
• all screening tests will have a certain number of false positives and false negatives
Why screen for hearing loss in newborns?

Importance of Early Identification

- Deafness, without screening, is detected late
- Hearing impairment has no visual indicators
- The most important period for speech and language development is 0-6 months of age ("critical period")
- The average age of identification in the absence of screening is over 12 months of age – i.e. too late

Options for hearing screening of newborns

1. targeted screening of children who are born with risk factors for hearing impairment, or
2. universal screening of all newborns

Why universal newborn hearing screening for newborns?

- At risk testing only picks up 50% of cases of permanent congenital hearing impairment (PCHI) at most
- Technology is available to screen neonates universally; quick, easy, painless
- Diagnosis, early intervention and support services are available
- Potential to relieve enormous burden of disability caused by
  - language delays and deficits
  - academic delays and disadvantages
  - social impairments
  - economic disadvantages (i.e. vocational)

Congenital Hearing Loss - background

- 0.9 – 1.3 per 1000 births: congenital, bilateral, moderate or greater degree*
- 0.6 – 1.0 per 1000 births: unilateral or mild hearing loss
- Evidence base that UNHS leads to reduced age at diagnosis & commencement of intervention post diagnosis
- "target condition" of UNHS

International and interstate

- Universal newborn hearing screening is the international standard of care
  - mandated in most states in the USA
  - UK screening 100% of their 600K annual births
  - all Australian states now have at least partial pre-discharge hearing screening
  - effectiveness established – UNHS here to stay

NHS Nationally

<table>
<thead>
<tr>
<th>State/Territory</th>
<th>Screening protocol</th>
<th>State population coverage</th>
<th>Identification rate per thousand (bilateral hearing impairment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vic</td>
<td>Double AABR</td>
<td>Currently 64%</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100% end 2010</td>
<td></td>
</tr>
<tr>
<td>NSW</td>
<td>Double AABR</td>
<td>&gt;95%</td>
<td>1.12</td>
</tr>
<tr>
<td>Qld</td>
<td>Double AABR</td>
<td>98.7%</td>
<td>1.37</td>
</tr>
<tr>
<td>TAS</td>
<td>Double AABR</td>
<td>Approx 94%</td>
<td>2</td>
</tr>
<tr>
<td>NT</td>
<td>Double AABR</td>
<td>&gt;97% @ RDH</td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>Triple AABR</td>
<td>&gt;97%</td>
<td>1.4</td>
</tr>
<tr>
<td>SA</td>
<td>Double TEOAE, AABR</td>
<td>97%</td>
<td>0.8</td>
</tr>
<tr>
<td>WA</td>
<td>TEOAE, AABR</td>
<td>46% +</td>
<td>0.9</td>
</tr>
</tbody>
</table>
Joint Committee on Infant Hearing (2000 & 2007)

Benchmarks for key components of the UNHS/EHDI process

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Screen by 1 month of age</td>
</tr>
<tr>
<td>3</td>
<td>Diagnostic audiological evaluation by 3 months for infants at risk</td>
</tr>
<tr>
<td>6</td>
<td>Enrolment of infants with HI into early intervention by 6 months</td>
</tr>
</tbody>
</table>

Victorian Infant Hearing Screening Program

VIHSP – at CCCH since 1992
- risk-status ascertainment
- behavioural screening via distraction test (7-9m)
Both of these groups referred for diagnostic audiology assessment

VicNIC 2003 – 2005 (CCCH)
- Pre-discharge AABR screening of all babies in NICU and associated SCN

VIHSP UNHS Expansion Schedule

- 2005-2007: 7 hospitals, 30% of Vic births
- 2008: + all remaining public metro hospitals, 57% of Vic births
- 2009-10: + all regional hospitals, 80% of Vic births
- 2010: + all remaining metro private hospitals & home births, 100% of Vic births

VIHSP 2005 - 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>% of population (risk factor screening)</th>
<th>% of population (universal screening)</th>
<th>Expected number referred</th>
<th>Expected number diagnosed</th>
<th>Referrals: diagnosis ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre 2005</td>
<td>100%</td>
<td>0%</td>
<td>3500</td>
<td>70</td>
<td>50:1</td>
</tr>
<tr>
<td>2005 (Phase 1)</td>
<td>70%</td>
<td>30%</td>
<td>2650</td>
<td>70</td>
<td>38:1</td>
</tr>
<tr>
<td>2008 (Phase 2)</td>
<td>43%</td>
<td>57%</td>
<td>1904</td>
<td>70</td>
<td>27:1</td>
</tr>
<tr>
<td>2009-10 (Phase 3)</td>
<td>20%</td>
<td>80%</td>
<td>1260</td>
<td>70</td>
<td>18:1</td>
</tr>
<tr>
<td>2010 (Phase 4)</td>
<td>0%</td>
<td>100%</td>
<td>700</td>
<td>70</td>
<td>10:1</td>
</tr>
</tbody>
</table>

Based on a 70,000 pa birth rate, 0% refer rate from RF program, and 1% refer rate from NHS

The VIHSP Newborn Hearing Screen

A hearing screen is one of the routine health checks babies have soon after birth. This is a quick and simple way to check the hearing of newborn infants.

Parents are given an information brochure ‘Your baby’s hearing screen’ during one of their antenatal visits.
The screen is quick and painless. Most babies are not unsettled by the screen and most stay asleep in their cots whilst the screen is being carried out.

The hearing screen can be done whilst a parent is cuddling their baby, or while a baby is being fed. The screener gives the results of the screen straight away.

The VIHSP NHS Process

How we are performing

Diagnostic results for VIHSP referred infants

For Sep – Dec 2009

<table>
<thead>
<tr>
<th>Births</th>
<th>Eligible</th>
<th>Declined (lost contact)*</th>
<th>Missed</th>
<th>Screened (total)</th>
<th>Screened as an inpatient</th>
<th>Passed Screen*</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>11,833</td>
<td>11,547</td>
<td>60</td>
<td>11,318</td>
<td>10,422</td>
<td>11,215</td>
</tr>
<tr>
<td>%</td>
<td>0.5%</td>
<td>0.3%</td>
<td>98%</td>
<td>92%</td>
<td>99.1%</td>
<td>99.1%</td>
</tr>
<tr>
<td>Target</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*Percentages based on number of eligible babies

In the period Feb 28th 2005 to Feb 28th 2010:
Number of infants screened by VIHSP: 127,000
Number of infants referred for diagnostic assessment: 1026
Refer rate: 0.8%
Recent achievements: NHS on the “radar”

- Media Release from the Office of the Prime Minister, 29 June 2009: Hearing Screening for all Australian Babies. “The Australian Government will seek a commitment from States and Territories to deliver newborn Hearing Screening for all Australian babies from 1 January 2011.”
- Inclusion of Neonatal Hearing Screening for first time in A Picture of Australia’s Children 2009 (AIHW)
- Neonatal Hearing Screening Working Group established (by Screening Subcommittee of the Australian Population Health Development Principle Committee)
  - i.e. UNHS now a federal interest with national approach

Challenges and Opportunities

The screening pathway: cross agency and cross-sector

<table>
<thead>
<tr>
<th></th>
<th>DH</th>
<th>DEECD</th>
<th>LGA</th>
<th>Hospitals</th>
<th>Pvt Scrs/ Philanthropic</th>
<th>Federal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family Support</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Targeted surveillance</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habilitation/ intervention</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Future endeavours

- Evidence base for effectiveness of NHS in promoting language development
  - currently lacking (Wolff et al 2010); SCOUT project nearing completion
- Common assessment tools for outcome tracking and evaluation
  - Statewide? Across conditions? National? International?
- Standards, benchmarks, common reporting framework
  - Neonatal Hearing Screening Working Group
  - minimum standards for screening & post-screening
  - national quality and reporting framework
  - national approach to data collection/data sharing

Thank you!

Further Information
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