The diagnostic accuracy of school hearing screening tests and cost-effectiveness of school entry hearing screening programmes

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Why assess school hearing screening?

– 1950s Started in UK
– From 2006: Universal Newborn Hearing Screening (England)
  • Very effective (~half of cases identified at birth)
– HTA report 2007 – Bamford, Fortnum et al\(^1\):
  • Little good evidence for effectiveness of screen
  • Still picks up some permanent losses otherwise missed
  • Troublesome conductive hearing loss can be referred
  • Does it use the best test?

\(^1\)Bamford et al “Current practice, accuracy, effectiveness and cost-effectiveness of the school entry hearing screen” HTA 2007; 11(32)
History of this project

- Aug 2007: Bamford, Fortnum et al published
- Dec 2009: First HTA call - not awarded
- July 2010: 2nd HTA call for a further study
- Dec 2010: Submitted outline application
- Jan 2011: Invited to submit full application
- Apr 2011: Submitted full application
- Aug 2011: Awarded funding
- Sep 2011: Began
- Dec 2014: Completed
- 26 Mar 2015: Report submitted
Purpose today – explain:

“SES is also unlikely to be cost-effective when judged against the benchmarks normally used by NICE, relative to a system reliant on ad hoc referral when a suspicion of hearing impairment is raised. The results are dependent, however, on the Nottingham/Cambridge comparison.”
The SES Project Team

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University of Exeter: Chris Hyde, Obi Ukoumunne, Vasilis Nikolaou, Zhivko Zhelev, Rod Taylor

University of Plymouth CTU: Laura Cocking
Nottingham University Hospitals NHS Trust: Claire Benton
Cambridgeshire Community Services NHS Trust: Jo Moody
Nottinghamshire Healthcare NHS Trust: Ann Allardice, Mary Barks

Economic modelling (Optimity Advisors): Clive Pritchard, Sarah Roberts

Parent representative: Jules Watson

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Diagnostic Accuracy Estimates
(95% confidence intervals)

**Sensitivity:** Proportion of hearing impaired ears correctly identified with a hearing impairment
- PTS: 94.2% (89.0%, 97.0%)
- HC: 89.0% (82.9%, 93.1%)

**Specificity:** Proportion of non-hearing impaired ears correctly identified as not having hearing impairment
- PTS: 82.2% (77.7%, 86.0%)
- HC: 86.5% (82.5%, 90.0%)
False negatives

- Little in the literature

- Diagnostic study
  - 16 ears passed one or both screens but failed PTA
  - 4 confirmed to have hearing loss at diagnostic evaluation
    - All mild
## Service comparison: referral data

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<th>Cambridge (no SES)</th>
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<td><strong>Referrals</strong>&lt;br&gt;(n: 3-7yrs old)</td>
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<td><strong>Base Population</strong></td>
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Cost-effectiveness

• SES unlikely to be cost-effective
• Dominated by no screening strategy
• Confirms clinical study
  – In the absence of SES, cases of hearing impairment
    • identified in similar numbers
    • but at a younger age

• BUT may be cost-effective if:
  – There are fewer referrals with SES
  – Referrals occur more quickly with screening than we observed.
In the context of the UK NHS, and similar health care systems, SES using screening tests like the PTS and HC is unlikely to be effective in increasing the number of cases of hearing impairment identified and lowering the age at which these cases are identified.

SES is unlikely to be judged to be cost-effective when judged against benchmarks used by the National Institute for Health and Care Excellence.
Implications for practice

• If SES is not cost-effective – withdraw it? BUT
  – Two scenarios in which it could be cost-effective
    – Findings dependent on only two services
    – Crucially dependent on effectiveness of ad-hoc referral
Implications for research

- On-going systematic review of diagnostic accuracy of screens
- Characterise and measure different approaches to ad-hoc referral
- Further observational studies in different services
- Opportunities for data collection where SES is withdrawn