Bone-anchored hearing aids for people who are bilaterally deaf: systematic review and economic evaluation

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Background

- Bone-anchored hearing aids (BAHAs) are used to help people with conductive or mixed hearing loss who cannot benefit from conventional hearing aids or from ear surgery.
- The benefits and costs of BAHAs are not known.

Objectives

- To conduct a systematic review and economic evaluation to assess the effectiveness of BAHAs for people who are bilaterally deaf.

Methods

- A systematic review and economic evaluation were undertaken using standard methodology. 19 electronic resources were searched.
- Prospective studies of BAHAs vs other hearing aids, no aiding, or ear surgery were eligible. Unilateral vs bilateral BAHAs were compared.
- A decision analytic model was informed by the results of the systematic review and estimated the cost effectiveness of BAHAs compared to bone conduction hearing aids (BCHAs) in separate cohorts of eligible adults and children.
- An NHS and personal social services perspective was used and the model estimated costs and benefits of BAHAs over a 10-year time horizon. An exploratory analysis was undertaken to establish the cost-effectiveness of BAHAs in terms of cost per quality adjusted life year (QALY) gained. Costs and outcomes were discounted at 3.5%.
- We assumed that QoL benefit from improved hearing could be proxied by levels of the hearing dimension in Health Utilities Index-3 (HUI3).
- Two levels of QALY gain from aided hearing were calculated:
  - QALY 1 = 0.178 (move from HUI level 6 to 5)
  - QALY 2 = 0.384 (move from HUI level 6 to 3)
- We assumed that the utility gain from aided hearing is the same for both BAHA and BCHA and that differences in outcome arise from differences in the proportion of individuals using the device ≥8 hours per day (BAHA use approx. 10% greater than use of BCHA).
- Sensitivity and scenario analyses were undertaken.

Results of review of clinical effectiveness

•41 studies were eligible and after selecting the highest level of evidence for each comparison, 12 studies were included.

•Many studies had methodological limitations.

•Studies suggested audiological benefits of BAHAs when compared with BCHAs or no aiding. A mixed pattern of results was seen when BAHAs were compared to air conduction hearing aids.

•Improvements in quality of life (QoL) with BAHAs were found by a hearing-specific instrument but not generic QoL measures.

•Patient preference, satisfaction and comfort were assessed by some studies but methods were flawed and results may be misleading.

•Studies demonstrated some benefits of bilateral BAHAs.

•Limited data were available on adverse events.

Economic evaluation

•No economic evaluations were identified on literature searches.

•The incremental cost per user receiving a BAHA, compared to BCHA, was £16,409 for children and £13,449 for adults.

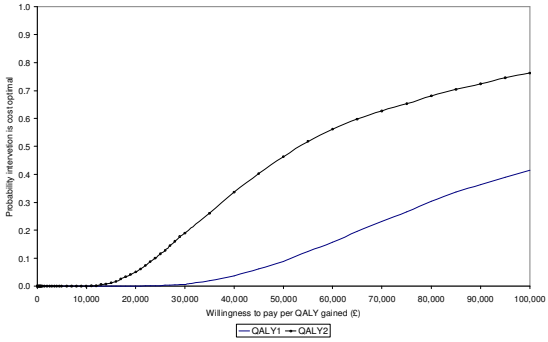
•The cost per case successfully treated with a BAHA was £18,651 for children and £15,785 and for adults.

•In our exploratory analysis, the base case analysis showed an incremental cost effectiveness ratio (ICER) of:
- £119,367 and £55,642 for children, and
- £100,029 and £46,628 for adults

where the difference in ICERs depends on the QALY gain used.

•The cost effectiveness acceptability curve (CEAC) for adults can be seen in Figure below.

Figure: CEAC for adults receiving a BAHA



•Providing BAHAs in place of BCHAs for adults had a probability of being cost–effective of 0.6% (QALY1) or 19% (QALY2), at a willingness to pay threshold of £30,000 per QALY gained.

•For children, providing BAHAs in place of BCHAs had a probability of being cost-effective of 0.1% (QALY1) or 12% (QALY2) at a willingness to pay threshold of £30,000 per QALY gained.

•Deterministic sensitivity analysis suggests results were sensitive to the assumed proportion of people using BCHA for ≥ 8 hours per day.

Conclusions

- **The quality of the available evidence is low therefore the results are subject to a high risk of bias.**
- **Exploratory cost-effectiveness analysis suggests BAHAs are unlikely to be cost-effective if benefits are similar for BAHAs and their comparators.**
- **The greater the benefit from aided hearing and the greater the difference in the proportion of people using the hearing aid 8 hours or more per day, the more likely BAHAs are to be a cost-effective option.**
- **Inclusion of other dimensions of QoL may also increase the likelihood of BAHAs being a cost-effective option.**
- **A national audit of BAHAs is needed.**

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