Changes in quality of life and the cost-utility associated with cochlear implantation in patients with large vestibular aqueduct syndrome

Bichey B G, Hoversland J M, Wynne M K, Miyamoto R T

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The use of cochlear implantation for patients with large vestibular aqueduct syndrome (LVAS). The comparator was the use of hearing aids in LVAS patients.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients at the Indiana University School of Medicine who had been diagnosed with LVAS in either ear, who were postlingually deafened, and had experienced severe to profound hearing loss over the last 6 years.

Setting
The setting was secondary care. The economic study was conducted in the USA.

Dates to which data relate
The dates to which the effectiveness data related were not provided.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The only cost considered was the aggregate cost of installing the implant at the medical centre at which the effectiveness study was conducted. The costing was therefore related to, but not conducted alongside, the effectiveness study.

Study sample
Power calculations to determine the sample size were not reported. Sixteen cochlear implant patients and 54 non-implant patients were identified from a review of radiology logs carried out to identify patients meeting the inclusion criteria. From this sample, 10 patients were selected from each group. The median age was 44.3 years in the cochlear implant group and 22.5 years in the non-implant group.
Study design
This was a non-randomised controlled trial that was carried out in a single centre. There was no loss to follow-up since the audiologist most familiar with the patient's condition completed the survey as proxy for those patients who could not be contacted.

Analysis of effectiveness
The basis of the analysis was not stated. The primary health outcome was the quality-adjusted life-years (QALYs). These were derived from the health utility indices (HUI), which were obtained from questionnaires sent to the patients. Pure tone averages of patients were also recorded.

Effectiveness results
The base-case average HUI score was 0.82 for cochlear implants versus 0.62 for hearing aids. This was a gain of 0.20 (standard deviation, SD=0.13; 95% confidence interval, CI: 0.12 - 0.28), giving a cost per QALY of $6,426 ($12,774 discounted QALY).

The mean pure tone average was 70.8 dB HL for the hearing aid cohort (SD=24.4 and 107.0 dB HL (SD=21.7) the cochlear implant cohort. The difference was statistically significant, (p=0.010).

Clinical conclusions
The results from the base-case indicated a significant increase in HUI of 0.20 associated with cochlear implantation, (p=0.037), in comparison with hearing aids.

Measure of benefits used in the economic analysis
The measure of benefit used in the economic analysis was the QALYs. These were determined by multiplying the expected life-years by the given HUI to derive a QALY for each patient. The age at which hearing loss was first identified (HL) for each patient was subtracted from their estimated current average lifespan of 76 years, to give the expected life-years.

Direct costs
The costs associated with cochlear implantation were gathered from the Indiana University School of Medicine department of Otolaryngology and Neck Surgery and from data available in the literature. The costs were for preoperative assessment, surgical fees, anaesthesia, hospitalisation, implant, postoperative therapy, audiological and communication assessment. Discounting was not relevant since the costs were incurred during less than one year. The price year was not reported.

Statistical analysis of costs
No analysis was undertaken.

Indirect Costs
No indirect costs were included in the analysis.

Currency
US dollars ($).

Sensitivity analysis
A sensitivity analysis was performed to evaluate changes in scoring conducted by proxy. This analysis involved
decreasing the hearing portion of each proxy survey by one (sensitivity 1) or two (sensitivity 2) levels.

The QALYs were not discounted at the base-case, but were discounted at 5% per annum in the sensitivity analysis.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
See the 'Synthesis of Costs and Benefits' section.

**Synthesis of costs and benefits**
The benefits and costs were combined to estimate a cost per QALY. The cost per QALY for cochlear implants was $6,426 ($12,774 discounted) for the base-case, $8,970 ($17,832 discounted) for sensitivity 1, and $27,120 ($53,913 discounted) for sensitivity 2.

Sensitivity 1, the average HUI score was 0.77 for cochlear implants versus 0.62 for hearing aids. This was a gain of 0.15 (SD=0.11; 95% CI: 0.05 - 0.22), giving a cost per QALY of $8,970 ($17,832 discounted QALY).

Sensitivity 2, the average HUI score was 0.67 for cochlear implants versus 0.62 for hearing aids. This was a gain of 0.05 (SD=0.12, 95% CI: -0.03 - 0.13), giving a cost per QALY of $27,120 ($53,913 discounted QALY).

**Authors' conclusions**
The results indicated an improvement in quality of life associated with postlingually deafened implant recipients. When compared with other disease states, favourable cost-utility figures were also noted for this group of patients.

**CRD COMMENTARY - Selection of comparators**
Although no explicit justification was given for the comparator used, it would appear to represent current practice in the authors' setting. You should decide whether the comparator represents current practice in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis used a non-randomised controlled trial, which was appropriate for the study question. The sample size was small and this may have influenced the results. No statistical analysis was performed to establish whether the groups were comparable at analysis. The median ages of the two groups were very different, which may have impacted on the authors' findings.

**Validity of estimate of measure of benefit**
The estimation of benefits was obtained directly from the effectiveness analysis, but no justification was given for the choice of estimate (QALYs).

**Validity of estimate of costs**
The analysis of costs was conducted from the perspective of the institution. It would appear that all the relevant direct costs were included in the analysis. The unit costs and the quantities of resources were not reported separately in the analysis. The cost estimates were specific to the study setting and no sensitivity analyses were undertaken. The price year was not reported.

**Other issues**
The authors compared their findings with those from other sources, and found that they compared well with other studies of cochlear implantation. The authors also compared their findings with QALYs for other treatments. A sensitivity analysis was conducted around the proxy scoring for those surveys not completed by patients. The study referred to patients who were hard of hearing and this was reflected in the conclusions of the analysis.

**Implications of the study**
The authors made no recommendations for policy or practice.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
11981389

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adolescent; Adult; Aged; Audiometry, Pure-Tone; Child; Cochlear Implantation /economics; Cost-Benefit Analysis; Health Care Costs; Health Status Indicators; Hearing Aids; Hearing Loss, Sensorineural /etiology /physiopathology /surgery; Humans; Middle Aged; Quality of Life; Sensitivity and Specificity; Syndrome; Vestibular Aqueduct /abnormalities

**AccessionNumber**
22002000899

**Date bibliographic record published**
30/04/2004

**Date abstract record published**
30/04/2004