Universal newborn hearing screening: the Colorado story

Downs M P

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
Identification of sensorineural or conductive hearing loss in new-born infants.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Newborn infants.

Setting
Hospital. The location of the economic study was not stated.

Dates to which data relate
Effectiveness and resourcedata were gathered between 1992 and 1995. Price years were not stated.

Source of effectiveness data
Derived from a single multi-centre study.

Link between effectiveness and cost data
Costing was undertaken on the same patient sample as used in the study. It was not stated whether costing information was gathered prospectively or retrospectively.

Study sample
All newborn infants at 40% of Colorado's hospitals were screened: 14,494 individuals in total. Power calculations were not used to determine sample size.

Study design
Multi-centre case series. Infants were referred to their physicians for follow-up, thus there was no loss to follow-up.

Analysis of effectiveness
The analysis of clinical outcomes was based on intention to treat. The primary health outcomes were cases found of
newborn infants with sensorineural or conductive hearing loss.

**Effectiveness results**
13,769 (95%) passed the screening test. Of the 725 (5%) who failed, 678 passed the follow up screening tests (4.68%) whilst 47 (0.32%) were confirmed to have hearing loss. 37 had sensorineural hearing loss whilst 10 had conductive hearing loss. No confidence intervals or p values were reported.

**Clinical conclusions**
Diagnostic testing of only 18 normal babies was required to identify one with significant sensorineural hearing loss, whilst only 15 required testing to identify one with sensorineural or conductive hearing loss.

**Outcomes assessed in the review**
The effect of early identification of hearing loss on an infant's language and general development.

**Study designs and other criteria for inclusion in the review**
Not stated.

**Sources searched to identify primary studies**
Not stated.

**Criteria used to ensure the validity of primary studies**
Not stated.

**Methods used to judge relevance and validity, and for extracting data**
Not stated.

**Number of primary studies included**
A follow-up study of 4 groups of children in Colorado who were identified as having hearing difficulties at different ages: between 2 months and 3 months (14), 3 months and 12 months (11), 13 and 24 months (24) and after 25 months (14). These children were then tested at 40 months using the Minnesota Child Development Inventory (MCDI).

**Methods of combining primary studies**
Not applicable.

**Investigation of differences between primary studies**
Not applicable.

**Results of the review**
The group of children identified with hearing loss between 2 months and 3 months attained 87% of normal in the MCDI language subtest and achieved the highest general development subtest results of the four groups (this difference was statistically significant). The next highest group scored 66% of normal on the MCDI language subtest. After audiological category separation, those in the most severe category who were in the early identification group scored nearly 30% higher in the subtests.
Measure of benefits used in the economic analysis
Cases of sensorineural and conductive hearing loss identified in newborn infants.

Direct costs
Cost data was obtained from the Colorado State Department of Health: specifically, the average cost of testing for hearing loss, which includes the costs of trained technicians (the majority are voluntary and unsalaried), materials, and certified audiologists.

Currency
US dollars ($).

Sensitivity analysis
Not performed.

Estimated benefits used in the economic analysis
47 newborn children with hearing loss were identified as a result of the screening programme.

Cost results
The average cost of direct testing was $25 per test (range $20 to $65).

Synthesis of costs and benefits
The cost of identifying one newborn infant with sensorineural hearing loss was $9,793. The cost of identifying a newborn infant with either sensorineural or conductive hearing loss was $7,710. No incremental analysis was performed.

Authors’ conclusions
The cost of identifying newborn infants with hearing losses compared favourably with other programmes which identify deficiencies at birth (such as PKU, Sickle Cell Anaemia and Hypothyroidism) which cost of the order of $40,000 for each case detected. Early detection of hearing loss reduced the deficiency in the general and language development of such children.

CRD Commentary
This study does not provide well-founded conclusions that screening for hearing loss is cost-effective. Costs per case detected have been compared with costs per case detected after screening for other disorders, not with cost per case of hearing loss disorders due to no-screening (the implicit comparator). An estimation of the costs derived from not screening should have been undertaken (based on prevalent costs of hearing loss disorders in the infant population) in order to assess the relative cost-effectiveness of screening. Other flaws in this study include: no assessment of the sensitivity/specificity of the diagnostic test was made; no information about the source and components of the costing data was provided; no price dates were mentioned, nor was discounting performed to allow for time preference; the perspective taken for costing was very narrow (incidentally, assuming technician labour as voluntary makes results difficult to generalise to other settings); no sensitivity analysis was performed to allow for uncertainty in the measurement of costs.

Implications of the study
A proper economic evaluation to assess cost-effectiveness of screening for hearing loss disorders in infants is needed.
Source of funding
None stated.

Bibliographic details

PubMedID
7665273

Other publications of related interest
An article by K R White and A B Maxon (Universal screening for infant hearing impairment: simple, beneficial, and presently justified. International Journal of Paediatric Otorhinolaryngology 1995,32:201-211), also concluded that universal screening for hearing loss was both efficacious and cost-effective, although a different test protocol was used.

Indexing Status
Subject indexing assigned by NLM

MeSH
Awards and Prizes; Colorado; Cost-Benefit Analysis; Costs and Cost Analysis; Hearing Disorders /diagnosis /prevention & control; Hearing Tests; Humans; Infant; Infant, Newborn; Neonatal Screening /economics /methods; Otolaryngology; Societies, Medical; United States

AccessionNumber
21995000798

Date bibliographic record published
30/11/1997

Date abstract record published
30/11/1997