Cost-effectiveness of a telephone-delivered education programme to prevent early childhood caries in a disadvantaged area: a cohort study

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.

CRD summary
The objective was to assess the costs and patient outcomes for a telephone-delivered education programme to prevent caries in young children from a low-socioeconomic, socially disadvantaged area. The authors concluded that the programme could generate considerable and immediate patient benefits and cost savings. Overall, the reporting and methods were reasonable. The authors’ conclusions are appropriate, but should be considered with the limitations in mind.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective was to assess the costs and patient outcomes for a telephone-delivered education programme to prevent caries in young children from a low-socioeconomic, socially disadvantaged area.

Interventions
The prevention programme was compared with usual care. With the programme, mothers were telephoned when their children were aged approximately six, 12, and 18 months. The calls lasted an average of 15 to 20 minutes, and consisted of oral health education, including dietary advice and tooth brushing instruction. Free toothbrushes and toothpaste were mailed to participants, after each call. Usual care consisted of no contact with the dental service, reflecting current practice in Australia.

Location/setting
Australia/primary care.

Methods
Analytical approach:
A Markov decision model was constructed to assess the costs and effects of the programme, for a cohort of children aged six months, until the age of six years (11 six-month cycles). The two key health states were healthy and caries, with the possibility of treatment or no treatment for caries. All treatment resulted in a return to healthy. The perspective was not explicitly stated, but was implied to be that of the health service provider [correspondence from the authors has confirmed this].

Effectiveness data:
The key effectiveness parameter was the proportion of children developing caries, which was from the authors' study. Full details were published elsewhere (see Other Publications of Related Interest). For this analysis, 185 patients receiving prevention were compared with a cohort of 40 two-year-old children from the same district who received usual care. These data were used to derive six-month caries incidence; which was assumed to remain constant over the 5.5 years. Other data, such as the probability that a new patient was treated within six months, and the probabilities for the treatments received, were from the Logan-Beaudesert clinical database. Data for the last 100 patients under six years old, who were treated under general anaesthesia at the district oral health service, up to 1st January 2009 were extracted. These data were used to inform the probabilities for both groups. To ensure that the maximum waiting time for treatment reflected that observed in the dental service (18 months), the probability of treatment was amended so that all patients received treatment within this period.
Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The health benefit was measured by the reduced incidence of caries. Benefits were discounted at an annual rate of 5%.

Cost data:
The costs were divided into health care costs for all children, and programme costs. Programme costs included staff
time, telephone calls, packing and posting oral care products, and administration for recording, filing and recalling
items; obtained directly from the study. Health care costs included restorations, extractions, and crowns. These costs
were from the schedule of fees for dental services from the Australian Dental Association. Where more than one code
could apply, a range of costs was recorded. Extractions included the cost of anaesthesia, as children were not expected
to be cooperative, and the costs for antibiotics and analgesics for a proportion of the children awaiting extraction.
Medication costs were from Australian national price lists, for amoxicillin and paediatric paracetamol. All costs were
discounted at an annual rate of 5%, and were converted to 2012 UK £ using the Organization for Economic Co-
operation and Development (OECD) purchasing power parity rate of one Australian dollar equals £0.81.

Analysis of uncertainty:
Univariate and probabilistic sensitivity analyses were conducted to assess the impact of parameter uncertainty on the
model results. In the univariate analysis, the parameters were varied to plausible ranges. For the probabilistic analysis,
appropriate distributions were assigned to each of the parameters.

Results
For every 100 children up to six years old, the estimated total costs were £19,926 with the programme, compared with
£89,910 for usual care. The number of caries was estimated to be 11 with the programme compared with 54 with usual
care.

The prevention programme dominated usual care, as the programme was more effective (preventing 43 caries per 100
children) and less costly (saving £69,984 per 100 children).

In the univariate sensitivity analysis, the results were most sensitive to varying the caries incidence, the costs of general
anaesthesia, and the discount rate. The programme remained dominant in all analyses. Similarly, in the probabilistic
analysis, the programme was dominant in all simulations.

Authors’ conclusions
The authors concluded that the prevention programme was likely to generate considerable and immediate patient
benefits and cost savings.

CRD commentary
Interventions:
The intervention and comparator were clearly stated. A detailed description of the intervention was provided, and usual
care (no contact) was an appropriate comparator reflecting Australian practices.

Effectiveness/benefits:
The sources for the effectiveness data were stated. The economic analysis was undertaken alongside the authors’ cohort
study. Few details of the study were presented in this paper. The details in the other report, which compared three
interventions, highlighted differences in reporting of the size of the telephone delivered intervention sample, which
impacted on the incidence of caries in the intervention group. The reason for these differences was not discussed;
increasing uncertainty. No baseline characteristics for the two groups were provided, making it difficult to verify their
comparability for risk of caries. The sample was small, particularly for usual care. The authors stated that it would have
been useful to incorporate quality-of-life changes in their model, but they did not gather these data, due to difficulties
in measuring quality of life in young children.

Costs:
A health service provider perspective was adopted. The cost categories and associated values were clearly reported.
Resource use was not reported; rather the type of treatment was derived from the Logan clinic database and incorporated as a probability within the model, to which the appropriate costs were apportioned. The authors indicated that there was variation in the cost of the general anaesthetic depending on the country and the child's treatment needs. They pointed out that their analysis did not include out-of-pocket costs and potential losses of income for families. The inclusion of these costs could have made the intervention more cost-effective, as these additional costs would fall mostly on the usual care group, where additional treatment would be required for non-prevented caries. They acknowledged that the patients might be particularly difficult to reach, and extra resources might be required, for example, where mothers did not own a telephone. It was unclear what impact this could have on the costs.

Analysis and results:
The model was clearly described, with an appropriate diagram and the results were clearly reported. The authors highlighted two limitations. First, the model simplified the complex process of childhood caries, without accounting for varying eruption time of deciduous teeth, and varying risk of caries, in the first two years of life. Second, the primary data were combined with clinical data to estimate the model inputs. The model extrapolated two years of data to six years, assuming constant rates; the impact of this assumption is unknown and was not tested in sensitivity analysis. The results of the analysis were clearly reported, but limited by the lack of clarity around the incidence data and the apparent discrepancies between the two publications. The probability distributions and methods for the sensitivity analyses were generally appropriate. As the effectiveness and cost data were specific to the Australian setting, the results are unlikely to easily generalise to other settings.

Concluding remarks:
The reporting and methods were reasonable. The authors’ conclusions are appropriate, but the high levels of uncertainty should be noted.

Funding
Funded by the Australian Centre for Health Services Innovation; the National Health and Medical Research Council of Australia; and Queensland Health.

Bibliographic details

PubMedID
23674443

DOI
10.1136/bmjopen-2013-002579

Other publications of related interest

Indexing Status
Subject indexing assigned by CRD

MeSH
Child, Preschool; Dental Caries; Health Education, Dental; Humans; Poverty Areas; Cost-Benefit Analysis; Telemedicine; Primary Prevention; Australia; Markov Chains; Child

AccessionNumber
22013020441

Date bibliographic record published

Date abstract record published
06/11/2013