The use of inhalation sedation and local anaesthesia as an alternative to general anaesthesia for dental extractions in children

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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 inhalation sedation and local anaesthesia for dental extractions performed in children.

Type of intervention
Anaesthesia.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised children referred for exodontia. Children who were less than 3 years of age were excluded, as were those who did not speak English, who were intellectually impaired, or who refused to sit in a dental chair for an examination. Also excluded were children who had obstructed nasal airways or acute orofacial swellings.

Setting
The setting was secondary care. The economic study was carried out at the Unit of Paediatric Dentistry at the University of Manchester Dental Hospital, Manchester, UK.

Dates to which data relate
The effectiveness and resource use data were gathered between December 1992 and June 1994. The price year was 1994.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing was performed prospectively on the same sample of patients as that used in the effectiveness study.

Study sample
Power calculations to determine the sample size were not reported. Eligible children were selected from the whole pool of patients referred to the study hospital during a 12-month period. Parents were contacted and, if consent was obtained, the patient was included in the study sample. Of the 567 patients initially assessed in the sedation group, 238 were not considered eligible. Similarly, 56 of the 360 patients initially seen in the comparison group were not eligible. A further 21 in the sedation group were excluded because consent was not obtained. Orofacial swelling and a lack of cooperation during the examination were the main reasons for ineligibility (31.7%). Therefore, the study sample
comprised 308 children in the sedation group and 304 children in the comparison group. The two groups of children were then matched to obtain comparable groups. This led to a final overall sample of 530 children with 265 patients in each group. The mean age was 7.63 (+/- 2.45) years in the sedation group and 7.54 (+/- 2.46) years in the comparison group. The gender distribution was 54% male and 46% female in both groups.

Study design
This was a prospective cohort study, which was carried out in a single centre. A computerised procedure was applied to randomly select some patients in order to match the two groups by age and gender distribution. However, this random procedure had no impact on the allocation of the children to the study groups, which was based on the parents’ consent. The patients were not followed after the extraction was complete.

Analysis of effectiveness
The analysis of the primary outcome referred to all patients included in the initial study sample. In the analysis of the secondary outcomes, only children with available data were considered. The primary health outcome was the treatment success rate (proportion of patients who completed all planned extractions). The parents were given a questionnaire with the aim of assessing the reaction of the child during the visit and during the treatment provided (using a Visual Analogue Scale, VAS), and to establish which treatment they would choose for further extractions in the future. A statistical analysis to assess the impact of factors potentially related to sedation success was also conducted. The study groups were comparable at baseline in age and gender distribution due to the matching procedure.

Effectiveness results
The treatment success rate was 83.4% with sedation and 98.9% with general anaesthesia, (p<0.0001).

Of the 44 sedation patients who did not complete the intervention, 23 were referred for general anaesthesia, 1 had treatment completed with local anaesthesia alone, and 20 failed to return for a subsequent visit having completed their treatment successfully at the previous visit.

The statistical analysis revealed that regularity of dental attendance, age and the number of teeth needing extraction were correlated with the success of sedation. Children who regularly attended dentist visits, who were older, and who had fewer teeth requiring extraction were more likely to be associated with successful treatment.

A total of 93.6% of the parents in the sedation group and 77.7% in the comparison group completed the questionnaire. The results obtained were as follows:

70.7% of sedation parents and 32.8% of comparison parents considered their child to be happy, with the majority (50.3%) of comparison patients saying that their child was unsure;

61.3% of sedation parents and 30.7% of comparison parents reported that their child was not distressed.

A total of 66.4% of the parents in the sedation group and 57.3% of the parents in the comparison group completed the VAS. The score for the reaction of the child was 76.25 (+/- 19.51) in the sedation group and 62.86 (+/- 36.20) in the comparison group. The score for the parents’ reaction was 82.18 (+/- 16.87) in the sedation group and 66.30 (+/- 24.38) in the comparison group.

Almost 86% of sedation parents would opt for the same procedure in the future. This percentage fell to 23.6% in the comparison group. All differences were statistically significant.

Clinical conclusions
The effectiveness study showed that the success rate was far higher in the general anaesthesia group, but the whole experience was considered as significantly more positive for parents in the sedation group.
Measure of benefits used in the economic analysis
The health outcomes were left disaggregated and no summary benefit measure was used in the economic study. Therefore, a cost-consequences analysis was, in effect, conducted.

Direct costs
Discounting was not relevant since the costs per patient were incurred during a short time. The unit costs and the quantities of resources used were not reported separately. The health services included in the economic evaluation were the time taken for treatment and recovery and the staffing levels required for the two services. No other resources were considered. The cost/resource boundary of the study was that of the UK NHS. Treatment time was considered as the period between entering the surgery or theatre and leaving it to go to the recovery area. Recovery time was defined as the period between finishing the treatment and being discharged home. Staffing levels were estimated as the minimum agreed levels for each service. The resource use data were estimated using actual data derived from the sample of patients who were included in the effectiveness study. The resource use data were collected from December 1992 to January 1994. The salary bill was estimated using the midpoints of the NHS salary scales, which were then divided to give a relative cost ratio for staffing of the two services. The price year was 1994.

Statistical analysis of costs
The costs were not treated stochastically.

Indirect Costs
The indirect costs were not considered in the economic evaluation.

Currency
UK pounds sterling (€).

Sensitivity analysis
Sensitivity analyses were not performed.

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

Cost results
While treatment time was shorter for general anaesthesia, recovery time was significantly shorter for sedation patients. The total units of time required, weighted by staff levels (which were used to estimate the costs) were 64.3 in the sedation group and 80.8 in the comparison group. Therefore, inhalation sedation and local anaesthesia were cheaper than general anaesthesia.

Synthesis of costs and benefits
Not relevant as a cost-consequences analysis was carried out.

Authors' conclusions
Compared with traditional general anaesthesia, the use of inhalation sedation and local anaesthesia represented a cheaper procedure for dental extractions in children. The parents of the children undergoing dental extraction also preferred the sedation approach. However, a significantly lower success rate was observed in sedation patients.
Validity of estimate of measure of effectiveness
The analysis of effectiveness used a prospective cohort study. This was appropriate for the study question since a partial random procedure was applied to match the two groups, which were, in effect, comparable at baseline. The patients were not randomly allocated to the study groups and this could have introduced some bias when selecting the patients. However, the authors carried out some statistical tests to identify potential confounders. No justification for the sample size was provided, but it appears to have been sufficiently large to detect statistically significant differences between the groups. The method of sample selection was accurately reported. A large proportion of the children initially identified was subsequently considered unsuitable for the intervention. This may cast doubts on how representative the sample was and on the possibility of extending the study intervention to all paediatric patients.

Validity of estimate of measure of benefit
No summary benefit measure was used in the analysis because a cost-consequences analysis was conducted.

Validity of estimate of costs
The authors stated explicitly which perspective was adopted in the study. The inclusion of costs was restricted to the cost of the time spent on the procedure, which was based on the staff level required. The source of the cost data was reported, as was the price year, therefore simplifying relflation exercises in other settings. However, details of the resource use and unit costs were not provided. Also, no statistical tests were carried out on the cost data, which were treated deterministically. The costs were estimated in the national currency, but were then presented as the units of time required for the intervention on the basis of staffing levels.

Other issues
The authors made some comparisons of their findings with those from other studies. They did not, however, address the issue of the generalisability of the study results to other settings. Sensitivity analyses were not carried out and all the data referred to a single centre. Consequently, the external validity of the analysis was low and caution is required when extrapolating the results of the analysis to other settings.

Implications of the study
The authors suggested that the careful selection of patients suitable for inhalation sedation and local anaesthesia represents a key factor for the success of the intervention. A deeper discussion with the parents would be helpful. Future studies should be carried out to encourage greater use of sedation for dental extractions in children.

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Other publications of related interest

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