Cost-effectiveness of intrathecal baclofen therapy for the treatment of severe spasticity associated with cerebral palsy

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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 study examined the use of intrathecal baclofen, compared with conventional medical and surgical therapy, among children with severe spasticity of cerebral origin. No further details of the treatments (dosage, frequency and treatment provided for the comparator group) were provided.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population included two patient cohorts. The first cohort represented 20 children who would be suitable for intrathecal baclofen therapy but who were treated with conventional medical therapy. The second cohort comprised 20 children who received intrathecal baclofen therapy.

Setting
The setting was inpatient care (surgical placement of the device) and outpatient care (pre-pump and post-pump year). The economic evaluation was conducted in the USA.

Dates to which data relate
The symptom profile, functional impact of symptoms, and the benefits or complications associated with intrathecal baclofen treatment data were collected from 15 studies published between 1993 and 2003. Cost data and assumptions were collected from insurance claims records for the pre-implant year (1999), the pump implant year (2000) and the post-implant year (2001). The price year was 2003.

Source of effectiveness data
The clinical data for intrathecal baclofen treatment included the symptoms profile of a child with severe spasticity, the functional impact of these symptoms, and the potential benefits or complications associated with the treatment. Symptoms were quantified based on the scores of three instruments: Ashworth scores and the Paediatric Evaluation of Disability Inventory (mobility and self-care subscale scores). Clinical effectiveness data were not presented in the study as the focus was to develop the health states and assess their utility.

Modelling
A mathematical model with bootstrapping was developed and implemented (with Microsoft Excel) to simulate the 5-year course for the two cohorts. The utilities and costs were randomly sampled from members of each cohort and
adjusted for the 5-year period. The cost-effectiveness ratio was calculated. This procedure was replicated 1,000 times with replacement. The health states and model assumptions were presented in full in the paper.

Sources searched to identify primary studies
The clinical data used to develop the health states were derived from 15 studies of intrathecal baclofen treatment with different designs. All the studies were presented and information on sample size, age, study duration and study design was given.

Methods used to judge relevance and validity, and for extracting data
The authors reported that a review of the literature was conducted to identify the symptoms profile, functional impact of symptoms, and the benefits or complications associated with intrathecal baclofen treatment. The review inclusion criteria were clearly explained. The criteria were as follows:

- the mean or median age of the study population was younger than 18 years;
- the primary disease aetiology of most study participants was cerebral palsy or stated to be of cerebral origin;
- the route of administration for baclofen was the intrathecal pump; and
- the study focused on symptom and functional outcomes rather than purely physiological measures.

The methods used to review the literature were not reported.

Measure of benefits used in the economic analysis
The measure of benefit used was the quality-adjusted life-years (QALYs) gained. Five hypothetical health states, describing a typical child diagnosed with cerebral palsy and spastic quadriplegia, were reported. The health states were clearly explained, as was the definition of a typical child receiving therapy.

Nine experience clinicians rated the health state utilities using the Health Utilities Index Mark 2 and Mark 3 multi-attribute health status classification systems. It was reported that the Health Utilities Index-2 was considered primary for the study. The authors clearly explained the reasoning behind this. The benefits were discounted at an annual rate of 3%.

Direct costs
The direct costs included in the analysis were those of the insurer. It was stated that the identified costs included inpatient and outpatient facility fees, professional fees, outpatient pharmacy and home health services. Payments for durable medical equipment were excluded and a justification for this was provided. The total annual cost of treatment was computed for each individual, based on amounts paid by the insurer. The analysis was based on 18 cases. The mean and median annual costs, and ranges, were reported for the three phases of treatment. The unit costs and resource quantities were not presented. The price year was 2003 and the costs were adjusted using the Consumer Price Index. The costs were discounted at an annual rate of 3%.

Statistical analysis of costs
The authors provided descriptive statistics for the total costs, presenting the mean and median costs as well as the range (lower and higher value) for the three phases of treatment.

Indirect Costs
Inline with the perspective adopted, no productivity losses were considered.
Currency
US dollars ($).

Sensitivity analysis
Parameter uncertainty was investigated through two alternative scenario analyses. In scenario one the authors tested the impact of adverse events occurring over long-term treatment. In scenario two the authors tested an increase in costs by 10% per year as a consequence of an increasing complexity of alternative treatment care. Estimates for the cost-effectiveness of intrathecal baclofen treatment relative to alternative medical and surgical treatment were derived using the bootstrapping technique. Modelling results were presented in the form of an acceptability curve.

Estimated benefits used in the economic analysis
The incremental QALYs with intrathecal baclofen therapy were 1.19 (interquartile range: 1.10 to 1.27) for a 5-year period.

Cost results
The treatment costs used in the model were presented for the three phases of the treatment.

For the pre-pump implant year, the mean cost was $10,293 (median 8,697; range: 49 to 36,103).

For the pump implant year, the mean cost was $32,171 (median 26,701; range: 15,348 to 65,114).

For the post-pump implant year, the mean cost was $17,338 (median $10,458; range: 70 to 62,246).

In the base-case, the mean incremental cost with intrathecal baclofen therapy was $49,400 (interquartile range: 36,700 to 62,200) for a 5-year period.

Synthesis of costs and benefits
The estimated benefits and costs were combined in the form of an incremental cost-effectiveness ratio.

The incremental cost per QALY for intrathecal baclofen therapy was $42,000/QALY (interquartile range: 30,500 to 52,200).

The sensitivity analysis showed an incremental cost-effectiveness ratio of $45,700/QALY (interquartile range: 34,000 to 56,500) for scenario 1 and $31,500/QALY (interquartile range: 20,800 to 42,300) for scenario 2.

The acceptability curve showed that the likelihood that intrathecal baclofen would have a cost per QALY of $50,000 or less was better than 70%.

Authors' conclusions
Intrathecal baclofen delivered via an implantable pump in appropriately selected paediatric patients offered good value for money.

CRD COMMENTARY - Selection of comparators
The comparator used (conventional medical therapy) represented current practice in the study setting. However, the intervention delivered under current practice was not clearly explained. You should decide if the comparator represents current practice in your own setting.

Validity of estimate of measure of effectiveness
A synthesis of published study results was carried out. However, the authors reported the inclusion criteria but not the search methods, and it is therefore possible that the data from the available studies might have been used selectively.
The characteristics of the retrieved studies (i.e. sample size, age of the participants, study duration and study design) were given. Treatment effectiveness was not a direct input for the model. Instead, this information was used to derive the health states, which were used as inputs for the model.

**Validity of estimate of measure of benefit**
The estimation of QALYs for each health state was computed for the 5-year period according to ratings of the health states that had been developed with information retrieved from the selected studies results. The utility computation was described in full. Nine clinicians rated the health state utilities using the Health Utilities Index Mark 2 and Mark 3. QALYs allow comparisons to be made with other technologies and they fully capture health outcomes.

**Validity of estimate of costs**
The analysis of the costs was performed from the perspective of the insurer, and the cost categories included appear to have been appropriate to this perspective. The reason for the exclusion of payments for durable medical equipment was clearly explained. The unit costs were not presented and neither were the resource quantities. The presentation of summary costs makes it impossible to know what aspects of costs were actually included in the cost categories. Health insurance claim records were used to compute the costs, which was appropriate to the third-party payer study perspective. The price year and method of price year adjustment were clearly stated and discounting was carried out appropriately. With the exception of the unit costs and quantities, which were not reported separately, most cost data were adequately reported.

**Other issues**
The authors compared their findings with those from a similar study on adults. The reported incremental cost-effectiveness ratio in the present study was higher than that in the previous study, owing to the higher costs and lower benefits of intrathecal baclofen therapy delivered to children. A comparison was made with other health technologies for children with severe health conditions, and intrathecal baclofen was shown to be within the range of other complex therapies that were widely accepted. The authors noted that intrathecal baclofen therapy might also lead to decreases in indirect costs, which were not incorporated in the model given the perspective of the study. For example, with improvement in the child's condition a parent may increase productivity. It was stated that the inclusion of indirect costs would have resulted in a more favourable cost-effectiveness ratio.

A number of limitations were reported. For example, the authors pointed out that the lack of data available for each claim did not allow a more accurate cost calculation. Therefore, the authors relied on total annual paid claims for each case as a conservative approach. In addition, some difficulties in applying the Health Utilities Index-2 were mentioned. The authors did not assess the issue of the generalisability of their results to other settings. The results of the study do not appear to have been presented selectively and their conclusions appear to reflect the scope of the analysis.

**Implications of the study**
A call for an instrument that would be more appropriate for assessing utilities among this study population was implicitly made. Intrathecal baclofen delivered via an implantable pump in appropriately selected paediatric patients offers good value for money when compared with current practice. However, the authors did not make any recommendations for policy or practice.

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