The costs and benefits of deep brain stimulation surgery for patients with dystonia: an initial exploration

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 health intervention examined in the study was deep brain stimulation (DBS) for the treatment of patients with dystonic conditions refractory to medical therapy.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis and cost-benefit analysis.

Study population
The study population comprised dystonic patients refractory to medical treatment.

Setting
The setting was hospital. The economic study was carried out in the UK.

Dates to which data relate
Effectiveness and resource use data were gathered over a two-year period but specific dates for the data collection were not reported. The price year was 2003.

Source of effectiveness data
The effectiveness evidence came from a single study.

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that included in the effectiveness analysis.

Study sample
The author did not report power calculations, to determine sample size. 26 eligible patients were included in the study. The method of sample selection was not clearly stated, and patient demographics were not reported.

Study design
This was a within-group comparison study, carried out at two centres. The same surgeon performed all interventions. Patients were followed-up for a maximum of two years and no patient was lost to follow-up. Mean follow-up was 25 months (range: 2 - 48 months).
Analysis of effectiveness
The effectiveness analysis took into account all patients included in the initial study sample. The primary outcome measures were utility and willingness to pay (WTP) levels, which were estimated from the sample of 26 patients included in the study. Utility values were elicited using the EuroQol (EQ-5D) instrument, which was administered pre- and post-surgery and was based on a visual analogue scale. WTP was used in the post-surgery period and patients were asked to provide their WTP for the operation. The questionnaire used to derive WTP values included two questions: 'How much per year would you be willing to pay for the benefits of your operation?' and 'What is your yearly income?'

Effectiveness results
The mean utility value was 29.0 (+/- 23.3) in the pre-operative period and 76.2 (+/- 16.7) in the post-operative period. The increase in utility was 47 (+/- 27.9), (p<0.01).

The mean WTP for the intervention was 291,231 (+/- 441,477). However, the median WTP value was 20,000.

Clinical conclusions
The effectiveness analysis showed that DBS significantly improved utility values. The WTP was used to calculate the net benefit of DBS.

Measure of benefits used in the economic analysis
The summary benefit measures used in the economic evaluation were quality-adjusted life-years (QALYs) and WTP. The former was derived from the effectiveness study assuming that the health benefit (increase in utility) remained constant over a two-year period.

Direct costs
The perspective adopted in the study was unclear but it appears that only costs relevant to the hospital were included. The analysis of costs included the three main stages of the procedure: preoperative assessment, surgery, and postoperative management/follow-up. The costs for the comparator, namely no intervention, were assumed to have been null. Preoperative costs included visits to the specialist and any inpatient stay to assess the patient's suitability. Surgery costs included MRI and CT scans, staff costs, inpatient stay and equipment costs. The costs of follow-up and management included staff time and hospital costs to manage adverse events. Cost per use of equipment was based on duration and annual utilisation rate. A detailed breakdown of cost items was provided. Unit costs and the quantities of resources used were extensively reported for each stage of the cost calculation. Resource use was derived from the sample of patients included in the effectiveness study. The source of unit costs was not stated. Discounting was not relevant as costs were incurred over a 2-year time period. The price year was 2003.

Statistical analysis of costs
Costs were treated deterministically.

Indirect Costs
Indirect costs were not included in the economic evaluation.

Currency
UK pounds sterling (£).

Sensitivity analysis
Sensitivity analyses were not carried out.

**Estimated benefits used in the economic analysis**
The estimated QALYs gained with DBS over no intervention were 0.94.

The average WTP for the intervention was 291,231 (+/- 441,477).

The median WTP estimate was 20,000.

**Cost results**
Over a two-year period, preoperative assessment costs totalled 856, costs for localization equipment were 1,593, costs for surgery (theatre, staff, tests, and procedures) amounted to 6,115, stimulation equipment costs per surgical episode were 11,104, and costs for follow-up management, replacement costs, and complications came to 12,275.

The total costs per patient were 31,942.

The greatest cost components were stimulation equipment costs (36% of total costs) and follow-up costs (37% of total costs).

**Synthesis of costs and benefits**
An incremental cost-utility ratio was calculated to combine costs and benefits.

The incremental cost per QALY gained with DBS over no intervention was 33,980.

The net benefit (benefit estimated using the WTP minus costs) was calculated in the cost-benefit analysis.

The net benefit was 259,289. However, when the median WTP was used, the net benefit was -11,942.

**Authors’ conclusions**
The study results suggest that DBS may be a cost-effective strategy for dystonic patients refractory to medical therapy in the UK. The authors highlighted the fact that dystonic patients are relatively young, thus decision makers should also consider the potential cost-savings associated with those patients’ return to employment.

**CRD COMMENTARY - Selection of comparators**
It was unclear whether the selection of no intervention as the comparator for DBS was appropriate. It was chosen to reflect medical therapy, which should be the current treatment for dystonic patients. However, the costs and benefits of standard care were not assessed in the study. You should decide whether medical treatment is a valid comparator in your own setting.

**Validity of estimate of measure of effectiveness**
The effectiveness data were derived from a small sample of patients. Utility values for the comparator were assumed to have been those gathered in the pre-intervention period. Thus, the same sample of patients was used to assess the efficacy of both standard care and the new intervention and there was therefore no external control group. This design is usually associated with some weaknesses, which limit the possibility of identifying a clear relationship between the intervention and the outcomes. In addition, only limited information on the characteristics of the sample of participating patients was provided. The authors acknowledged that the sample was small, but they also noted that the current analysis was a preliminary study. Thus, it is unclear whether the study sample was representative of the patient population. These issues might affect the validity of the analysis.
Validity of estimate of measure of benefit
The two summary benefit measures were appropriate as they were consistent with the cost-utility and cost-benefit analyses used in the study. Both measures were derived directly from the effectiveness analysis. The questionnaire used to elicit WTP values was included as an appendix to the paper, and the authors took into account the differences in baseline income of each patient enrolled in the study. However, the authors noted that WTP estimates can be prone to several biases, which could lead to an overestimation of the benefit. Both QALYs and WTP estimates have the advantage of being comparable with the benefits of other health care interventions.

Validity of estimate of costs
The perspective adopted in the analysis of costs was not clearly stated and only hospital costs appear to have been included. Unit costs and the quantities of resources used were presented separately, and details of the cost calculation were reported, which means that it should be possible to replicate the analysis in other settings. The price year was reported, which will facilitate reflation exercises in other settings. The source of costs was not reported, statistical analyses of costs were not performed, and cost estimates were specific to the study setting.

Other issues
The authors did not compare their findings with those from other studies and did not address the issue of the generalisability of the study results to other settings. Cost-utility results were compared with the results obtained for an intervention in motor neuron disease in the UK context, showing similar ratios. Sensitivity analyses were not carried out, which limits the external validity of the study. The analysis referred to dystonic patients and this was reflected in the authors’ conclusions. The authors noted that the study had several limitations, but that it represented a preliminary analysis of DBS. In particular, very high standard deviations were found around the WTP results, leading to very different mean and median values. Thus, the results of the cost-benefit analysis should be treated with some caution.

Implications of the study
The study results suggest that DBS for dystonic patients might be an effective and efficient strategy.

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Bibliographic details

Other publications of related interest


Indexing Status
Subject indexing assigned by CRD

MeSH
Cost-Benefit Analysis; Dystonic Disorders /prevention & control /surgery; Electric Stimulation /instrumentation; Electrodes, Implanted; Quality-Adjusted Life Years