Incremental cost-effectiveness of initial cataract surgery

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 initial cataract surgery with intraocular lens (IOL) implantation was examined.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The authors used visual acuity data for 722 US patients who underwent cataract extraction in a study by the US National Cataract Patient Outcome Research Team (PORT).

Setting
The setting was secondary care. Both the effectiveness and cost data related to the USA.

Dates to which data relate
The effectiveness data were derived from several studies published and referenced by the authors. In particular, the visual acuity data from the PORT study referred to patients who underwent initial cataract surgery between July 1991 and December 1991. Nominal 2000 US prices were used.

Source of effectiveness data
The effectiveness data were derived from a review of the literature and the opinions of clinical experts.

Modelling
A simple deterministic decision tree was used to determine the utility and cost resulting from cataract surgery (and its associated complications) and no surgery. The outcomes were assumed not to vary beyond 4 months. For the surgery option, the utilities were assigned to complications and no complications, and to the type of treatment for the complications. The probabilities of different treatment options, given the type of complication, were also included.

Outcomes assessed in the review
The clinical parameters in the model were the complication rates and visual results of cataract extraction. The complications considered were:

- posterior capsular opacification (PCO),
endophthalmitis,
lens dislocation,
cystoid macular oedema,
pseudophakic bullous keratopathy (PBK),
lost lens fragments, and
retinal detachment.

The study excluded those complications that occurred within 4 months from the baseline.

**Study designs and other criteria for inclusion in the review**
There was no indication that the authors conducted a systematic review for any of the parameters. No inclusion criteria were 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**
Not relevant.

**Methods of combining primary studies**
The mean 4-month postoperative visual acuity data used in the study for each complication were obtained from a series of published studies.

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

**Results of the review**
After 4 months following cataract surgery, the proportion of patients who did not suffer from any complication was 0.7, while that of patients who reported some form of complication was 0.3.

Of those patients suffering from complications, the proportions were 0.933 for those suffering from PCO, 0.037 for lens dislocation, 0.003 for corneal decompensation and 0.027 for retinal detachment.

The visual acuity was:

less than 20/70 for patients who had been affected by retinal detachment;
20/80 for patients who had suffered from PBK; and

20/50 for patients who had suffered from lens dislocations. The authors made assumptions to derive estimates of effectiveness.

**Estimates of effectiveness and key assumptions**

The authors assumed that, for 96.8% of patients who had been treated after suffering from PCO, the visual acuity returned to postoperative baseline levels. For patients suffering from retinal detachment, it was assumed that the complication occurred one year after cataract surgery.

**Measure of benefits used in the economic analysis**

The measure of benefits used was the quality-adjusted life-years (QALYs). The utility weights were derived from the literature. The source studies were reported to have been based on patient preferences and to have used the time trade-off method. The QALYs were discounted at a rate of 3%.

**Direct costs**

The direct costs of the hospital were included in the analysis. All ambulatory procedures, inpatient operating room costs and admission, and medication expenses relating to cataract surgery or its complications were included. The costs and the quantities were not reported separately. The annual discount rate used for the costs was 3%. The study determined the cost associated with treating each complication and the different treatment options. The costs were estimated using actual data, which were derived from the Medicare outpatient facility data and from the payments made by the Health Care Finance Agency to health care providers. The drug prices were obtained from the 2000 Drug Topics Red Book. All the costs referred to the year 2000.

**Statistical analysis of costs**

The costs were not treated stochastically.

**Indirect Costs**

The indirect costs were not included.

**Currency**

US dollars ($).

**Sensitivity analysis**

A one-way sensitivity analysis was performed, in which the costs, utility values and the discount rate were varied.

**Estimated benefits used in the economic analysis**

The patients who had not undergone cataract surgery were given a utility level of 0.71.

A mean utility value of 0.858 was obtained using a decision analysis for patients who had undergone cataract surgery. This mean value included the risks and consequences of complications over the remainder of the patient's life (estimated to be 12 years).

Thus, the net utility gain for initial cataract surgery was 0.148. The QALYs gained were 1.776 (1.25 when an annual discount rate of 3% was applied).
Cost results
Cataract surgery and its related expenditures for complications resulted in a total health care discounted cost of $2,525 per patient. The costs incurred from no surgery were assumed to be $0.

Synthesis of costs and benefits
The costs and benefits were combined by calculating an incremental cost-utility ratio ($ spent per QALY gained).

After discounting, the resultant incremental cost-utility ratio ($ per QALY) was $2,020.

From the sensitivity analysis, it was found that when the total costs increased by 25%, the $ per QALY gained was $2,525. When the total costs decreased by 25%, the $ per QALY gained was $1,212.

When all the utility values were raised by 25%, the $ per QALY gained was $1,605. When all the utility values were lowered by 25%, the $ per QALY gained was $2,703.

A discount rate of 10% implied a $ per QALY gained of $4,398.

Authors' conclusions
Cataract surgery in the first eye was a very cost-effective intervention in comparison with other interventions in ophthalmology, as well as non-ophthalmologic specialties. The authors expressed the view that cataract surgery in the second eye is also likely to be very cost-effective.

CRD COMMENTARY - Selection of comparators
The rational for the choice of the comparator was clear.

Validity of estimate of measure of effectiveness
The effectiveness measures in the paper were mostly derived from the current literature on cataract outcomes and complications. There was no indication that a systematic review had been conducted to derive any of the parameters. The authors clearly reported the method used to derive the estimates of effectiveness, as well as the sources used. The authors also derived some effectiveness measures based on their own opinion when interpreting the results from relevant literature.

Validity of estimate of measure of benefit
The measure of benefit was the QALY. The estimation of benefits was modelled. The instrument used to derive the measure of health benefit seems to have been appropriate. It consisted of a patient preference-based, time trade-off method. A decision tree was used to model the different clinical outcomes and their associated utilities. In addition, all the utility measures were discounted. However, the authors acknowledged that the utility values were not specifically obtained from patients with cataracts, but from those with visual loss in general, a circumstance that might have led patients to overestimate the utility associated with visual improvement.

Validity of estimate of costs
The perspective adopted in the study was not stated. The authors limited their analysis to the direct costs of the intervention. The authors considered a weakness of the study to be the fact that it did not consider the costs saved because of surgery, implying that costs might be incurred if no surgery were undertaken. The indirect costs of the cataract procedure and of its clinical complications were not considered. The cost estimates were specific to the US setting. The costs were discounted to account for their impact over the lifetime of the patients. The price year was reported, which aids the transferability of the results.
Other issues
The authors did not compare their results with those from similar studies. They did, however, discuss the generalisability of their results in that they highlighted the assumption that the visual acuity of the fellow eye was equal to the preoperative vision in the eye to be operated on, in all patients. The authors did not present their results selectively and their conclusions reflected the scope of the analysis.

Implications of the study
The authors concluded that cataract surgery is highly cost-effective in comparison with procedures across multiple medical specialties. This finding is likely to play an important role when policy makers decide on the allocation of resources among different specialities.

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