Cost utility for penetrating keratoplasty in patients with poor binocular vision

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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 compared penetrating keratoplasty (PK) for patients with bilateral poor vision due to corneal disease with no treatment.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients with bilateral poor vision owing to corneal disease. The pre-operative best-corrected binocular visual acuity had to be less than 20/50. PK was only performed on one eye.

Setting
The setting was secondary care. The study was undertaken in the University Eye Hospital Munich, Germany.

Dates to which data relate
The effectiveness data used to populate the model came from studies published between 1999 and 2003. The price year was not explicitly reported, but appears to have been 2005/06.

Source of effectiveness data
The clinical and epidemiological parameters in the model included the yearly transplant survival rate and visual acuity log values.

Modelling
The total discounted utilities were derived by calculating the proportion of transplants that survived each year, multiplying by the incremental utility associated with it, then discounting the yearly utility gain.

Sources searched to identify primary studies
The data on transplant survival were derived from a published longitudinal study. The gain in visual acuity log scores was derived from a retrospective study conducted at the hospital setting of this study. This might have been done by the authors.

Methods used to judge relevance and validity, and for extracting data
The process used to identify the published longitudinal paper was not reported.

**Measure of benefits used in the economic analysis**
The measure of benefit used was the quality-adjusted life-years (QALYs). QALYs were estimated for a 9-year period after suture removal (which occurred 1 year postoperatively). Stable acuity vision, and therefore constant utility, was assumed during this 9-year period. The authors used data from a published study to convert the visual acuity scores into utilities. The estimation of QALYs was dependent on the transplant survival rate, the incremental utilities and the discount rate. The benefits were discounted at a rate of 5%.

**Direct costs**
The costs to the hospital, the payer, were included in the analysis. These included the cost of the corneal graft, the surgical procedure, hospitalisation, follow-up ophthalmologic visits and optical rehabilitation. The cost of the graft, the procedure and hospitalisation were obtained from the German diagnostic-related group (DRG) reimbursement tables. The cost of ophthalmologic visits was derived from legal health insurance reimbursement tables. The cost of optical rehabilitation was derived from guidelines for accounting of contact lenses. Future costs were discounted at an annual rate of 5%. The price year appears to have been 2005/06. The costs of optical rehabilitation were from 1999, but they do not appear to have been inflated.

**Statistical analysis of costs**
No statistical analyses of the costs were conducted.

**Indirect Costs**
Productivity costs were not included.

**Currency**
Euros (EUR) and US dollars ($). The exchange rate was EUR 1 = $1.21.

**Sensitivity analysis**
Parameter uncertainty was investigated using one-way and multivariate sensitivity analyses. Upper and lower values, using fixed percentage changes, were varied individually and in combination. The parameters investigated were the utility value, probability of graft survival, and the discount rates for costs and QALYs.

**Estimated benefits used in the economic analysis**
The discounted QALY gained was 0.755.

**Cost results**
The discounted total cost of PK was EUR 7,210.

**Synthesis of costs and benefits**
The costs and benefits were combined in an incremental cost-effectiveness ratio (ICER).

PK was found to cost EUR 9,551 ($11,557) per QALY gained.

The sensitivity analysis found that the ICER was most sensitive to the utility values.

The multivariate sensitivity analysis produced a range of ICERs from EUR 6,191 to EUR 15,619 ($7,491 to $18,899).
Authors’ conclusions
Penetrating keratoplasty (PK) is cost-effective in patients with bilateral poor vision, despite the fact that surgery is expensive.

CRD COMMENTARY - Selection of comparators
Although no explicit justification was provided for the comparator used (i.e. no treatment), it would appear to represent current practice in the authors’ setting. You should decide if this represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The parameters for the model were derived from published research and combined with existing data from a retrospective sample of PK patients. The authors did not report any search methods or inclusion criteria used to identify the published study.

Validity of estimate of measure of benefit
The estimation of health benefits (QALYs) was derived using a formula. The QALYs gained were appropriately discounted, although they were only estimated for a 9-year period, ignoring the first postoperative year and thus potentially underestimating the health benefits. The authors referenced the study that they used to derive the utility values.

Validity of estimate of costs
The analysis of the costs was performed from the perspective of the provider. It appears that all the relevant categories of cost have been included in the analysis. As the analysis was based retrospectively on only patients who received treatment, it assumed that the cost of no treatment was zero. However, there are likely to be care costs associated with not receiving a corneal transplant, such that the cost-effectiveness analysis may be an underestimate. DRG and reimbursement costs were used to proxy prices, which was appropriate given the perspective of the study. The costs were appropriately discounted given the timeframe of the analysis. However, they were not inflated and this might have been necessary given some of the unit cost data used. The price year was not explicitly stated. The costs and the quantities were not reported separately, but the unit cost data were reported.

Other issues
The authors compared their findings with those from other studies in the area of ophthalmology that have shown PK to be cost-effective relative to other interventions. The authors evaluated the impact of their assumptions by undertaking a sensitivity analysis. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis, in particular that patients excluded from the retrospective analysis could also represent a cost-effective group. The authors did not report any limitations to their study.

Implications of the study
PK would appear to be a cost-effective intervention for patients with bilateral poor vision due to corneal disease. This evaluation should be considered when making health policy decisions. The authors made no recommendations for further research.

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Other publications of related interest
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Indexing Status
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MeSH
Adolescent; Adult; Aged; Aged, 80 and over; Corneal Diseases /economics; Cost of Illness; Cost-Benefit Analysis; Female; Health Care Costs; Health Services Research /economics; Humans; Keratoplasty, Penetrating /economics; Male; Middle Aged; Quality-Adjusted Life Years; Retrospective Studies; Vision Disorders /economics; Vision, Binocular; Visual Acuity

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