The economic impact of blue-light filtering intraocular lenses on age-related macular degeneration associated with cataract surgery: a third-party payer's perspective

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 technology studied was the implantation of new blue-light filtering intraocular lenses (BLF IOLs) compared with non-BLF IOLs in cataract surgery.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients aged 55 years and older who were undergoing cataract surgery.

Setting
The setting was secondary care. The economic analysis was carried out in the USA.

Dates to which data relate
The effectiveness data used as model inputs came from studies published between 1990 and 2004. The cost data were derived from sources published in 2004. The price year was 2004.

Source of effectiveness data
The clinical and epidemiological data used in the economic evaluation included:
- the 5-year incidence of AMD,
- the percentage of AMD patients with exudative AMD,
- the odds ratio of AMD after cataract surgery,
- the risk reduction rate with BLF IOL, and
- the percentage of treatments carried out by laser photocoagulation, verteporfin and pegaptanib.

Modelling
A decision analytical model was constructed to evaluate the outcomes per eye receiving one of two types of IOL following cataract surgery. A 5-year time horizon was adopted in the study as AMD would be likely to develop throughout a 5-year period. The three age groups investigated were 55 to 64 years, 65 to 74 years, and over 75 years.
Each group had a different risk of developing AMD.

**Sources searched to identify primary studies**
The clinical and epidemiological data were obtained from a number of clinical studies. The relative risk of AMD after cataract surgery was calculated from two large incidence-based epidemiological trials. Two preclinical studies (one laboratory based, one animal study) were used to derive the protective effect of BLF IOLs.

**Methods used to judge relevance and validity, and for extracting data**
A thorough review of the literature appears to have been conducted for the effectiveness estimate. The authors reported the details of the search strategy and sources searched. However, no inclusion or exclusion criteria were reported and it was not clear whether any quality assessment of the included studies took place. Where necessary, expert opinion was used to inform the clinical estimates. The same experts were used to validate the model input data.

**Measure of benefits used in the economic analysis**
The measure of benefit used was the number of AMD cases avoided.

**Direct costs**
The perspective of the third-party payer was adopted in the economic study. As such, all AMD-related costs were considered in the economic analysis. The cost categories included the costs of drugs, administration, ophthalmic visits, monitoring, ocuvite preservision and endophthalmitis. The unit costs were presented separately from the quantities of resources used. The resource and cost data were derived from published studies, official sources and expert opinion. Discounting was relevant, as the long-term costs were evaluated, and an annual rate of 3% was applied. The price year was 2004.

**Statistical analysis of costs**
The costs were treated deterministically in the base-case.

**Indirect Costs**
In line with the perspective adopted, no productivity losses were considered.

**Currency**
US dollars ($).

**Sensitivity analysis**
Extensive univariate and multivariate sensitivity analyses were carried out to assess the robustness of the model results to variations in the model inputs. The variables analysed included the incidence rate of AMD, the risk reduction of BLF IOL, and the cost of AMD treatment. The range of values tested for each variable was determined through a review of the literature plus expert opinion.

**Estimated benefits used in the economic analysis**
For the cohort of 100 eyes aged from 55 to 64 years, the incidence of BLF IOL versus non-BLF IOL was 0.58 versus 1.69 (difference 1.1).

For the cohort of 100 eyes aged from 65 to 74 years, the incidence of BLF IOL versus non-BLF IOL was 2.44 versus 6.98 (difference 4.55).
For the cohort of 100 eyes aged over 75 years, the incidence of BLF IOL versus non-BLF IOL was 9.23 versus 24.55 (difference 15.3).

**Cost results**
For the cohort of 100 eyes aged from 55 to 64 years, the total costs of BLF IOL versus non-BLF IOL were $44,549 versus $48,824, generating cost-savings of $4,275.

For the cohort of 100 eyes aged from 65 to 74 years, the total costs of BLF IOL versus non-BLF IOL were $91,016 versus $121,013, generating cost-savings of $29,997.

For the cohort of 100 eyes aged over 75 years, the total costs of BLF IOL versus non-BLF IOL were $142,558 versus $254,292, generating cost-savings of $111,734.

**Synthesis of costs and benefits**
An incremental cost-effectiveness ratio was not calculated as the strategy of BLF IOL was dominant (more effective and less costly).

The results of the baseline analysis remained robust throughout the univariate and multivariate sensitivity analyses.

**Authors’ conclusions**
This analysis suggested that the economic benefit of implanting blue-light filtering intraocular lenses (BLF IOLs) during cataract surgery would be achieved in all patients over a 5-year time horizon.

**CRD COMMENTARY - Selection of comparators**
The selection of the comparator was appropriate as non-BLF IOLs represented the common practice in the authors’ setting. You should decide if it is a valid comparator in your own setting.

**Validity of estimate of measure of effectiveness**
A thorough review of literature appears to have been conducted, with the strategy and sources being reported in full. The effectiveness data were derived from published studies, but there was insufficient information on the primary studies to enable an assessment of their internal validity. In addition, it was not clear from the reporting if the studies included were subjected to a quality assessment prior to inclusion. The epidemiological data used were selected for the robust methodology and they appear to have reflected the authors’ setting. The level of reporting was too limited to ascertain if the review was systematic, although it was more detailed than the majority of modelling studies.

**Validity of estimate of measure of benefit**
The authors used the number of AMD cases avoided as the measure of benefit in the economic analysis. This was appropriate given the nature of the disease.

**Validity of estimate of costs**
All cost categories that reflected the perspective adopted in the economic study were included. A breakdown of the cost items was presented. The sources of the resource use and unit cost data were extensively reported. The unit costs and the resource quantities were reported separately which will aid generalisability. The costs were discounted at an annual rate of 3%, which would appear appropriate in this instance. Uncertainty in the costs of AMD treatment was evaluated in the sensitivity analyses.

**Other issues**
The authors did not compare their results with the findings of other cost-effectiveness studies. They presented their
results in full and their conclusions reflected the scope of the analysis. In addition, the authors acknowledged and highlighted several limitations. First, the clinical data that demonstrated the efficacy of a BLF IOL in preventing AMD were derived from laboratory and animal studies because of the lack of prospective clinical trial data. Second, because of a lack of data on the annual incidence of AMD following cataract surgery, an overall odds ratio of developing AMD was applied to age-stratified baseline incidence rates to estimate age-specific AMD incidence in this model.

**Implications of the study**

Whilst the findings from this study support the use of BLF IOLs during cataract surgery, the authors highlighted the need for definitive proof about the effectiveness of BLF IOLs in reducing the risk of AMD, to be established in long-term prospective trials. They also noted the need for a lifetime economic analysis to ensure that all costs are captured.

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**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Aged; Cataract Extraction; Costs and Cost Analysis; Humans; Insurance, Health, Reimbursement; Lenses, Intraocular