Cost-effectiveness of monotherapy treatment of glaucoma and ocular hypertension with the lipid class of medications

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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 bimatoprost, latanoprost and travoprost for newly diagnosed and previously treated patients with glaucoma or ocular hypertension (OHT). The drugs were administered into both eyes once daily in the evening. The supply of the drugs was presumed to be 2.5 mL per month.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised newly diagnosed and previously treated patients with glaucoma or OHT.

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

Dates to which data relate
The effectiveness and resource use data were derived from studies published between 1996 and 2004. The price year was 2005.

Source of effectiveness data
The effectiveness evidence was derived from a synthesis of published studies.

Modelling
A decision model appears to have been conducted to derive the cost-effectiveness of the interventions, but limited information about the model was provided.

Outcomes assessed in the review
The outcome estimated from the literature was the percentage reduction in intraocular pressure (IOP), as measured in the early morning at the final study visit relative to the untreated baseline value.

Study designs and other criteria for inclusion in the review
It was unclear whether or not a systematic review of the literature had been conducted. All but one of the studies
Included were randomised, and were either investigator-masked or double-masked. The identified studies were approved by an institutional review board or similar body, and obtained informed consent from patients. Studies that used a run-in on timolol and measured baseline IOP on timolol treatment were excluded. The studies included reported data for 951 patients treated with bimatoprost, 1,598 treated with latanoprost, and 765 treated with travoprost. The duration of treatment in the primary studies ranged from 2 weeks to 1 year.

**Sources searched to identify primary studies**
MEDLINE was searched for studies published before March 2004 that evaluated one or more of these drugs as monotherapy in patients with elevated IOP.

**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**
Twenty primary studies provided the evidence.

**Methods of combining primary studies**
The average IOP reduction, weighted by the number of patients, was adopted.

**Investigation of differences between primary studies**
No differences between the primary studies were investigated.

**Results of the review**
The average reduction in IOP was 33.5% for bimatoprost, 29.8% for latanoprost and 30.3% for travoprost.
The patient-weighted average reduction in IOP was 32.4% for bimatoprost, 29.6% for latanoprost and 29.0% for travoprost.

**Measure of benefits used in the economic analysis**
The summary benefit measure was the percentage reduction in IOP due to the intervention. This measure of benefit was based on the effectiveness analysis.

**Direct costs**
The quantity/cost boundary adopted appears to have been that of the payer. Only drug costs derived from wholesale prices were considered. The unit costs were presented separately from the quantities of resources used. The authors made an assumption in the derivation of resource use. They assumed that one bottle of medication equalled one month of treatment, with no adjustment made for potential differences between medications in the number of drops of medication per bottle. Discounting was not relevant since the costs were incurred during one year. The price year was 2005.

**Statistical analysis of costs**
The costs were treated deterministically.
Indirect Costs
The indirect costs were not included in the economic evaluation.

Currency
US dollars ($).

Sensitivity analysis
One-way sensitivity analyses were conducted to test the robustness of the results. The parameters varied were the drug costs and the percentage reduction in IOP.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The cost of a 2.5 mL bottle was $62.10 for bimatoprost, $61.29 for latanoprost and $62.19 for travoprost.

Synthesis of costs and benefits
Average cost-effectiveness ratios (ACERs) and incremental cost-effective ratios (ICERs) were calculated to combine the costs and benefits of the interventions. The ACER was defined as the monthly cost per 1% reduction in IOP in glaucoma and OHT patients. The ICER was defined as the differential monthly cost for an additional 1% reduction in IOP.

The ACER was $1.92 for bimatoprost, $2.07 for latanoprost and $2.14 for travoprost. The ICER for each additional 1% reduction in IOP provided by bimatoprost over latanoprost was $0.29. Travoprost was dominated by both bimatoprost and latanoprost.

The robustness of the results was tested by changing the costs of latanoprost from $61.29 to $58.38, and fixing the costs of all three drugs to $61.29. The sensitivity of the results to efficacy was determined by changing the patient-weighted average reduction in IOP from 32.4 to 32.7% for bimatoprost, from 29.6 to 29.3% for latanoprost, and from 29.0 to 29.6% for travoprost. The sensitivity analyses revealed that the rank order of the cost-effectiveness of the drugs (bimatoprost > latanoprost > travoprost) was robust to costs and efficacy.

Authors' conclusions
Bimatoprost had the most favourable cost-effectiveness among the drugs compare. The rank order of cost-effectiveness of the lipid class of intraocular pressure (IOP)-lowering drugs for monotherapy in glaucoma and ocular hypertension (OHT) was bimatoprost > latanoprost > travoprost.

CRD COMMENTARY - Selection of comparators
The selection of the comparators appears to have been appropriate since all three drugs were widely used for the treatment of glaucoma and OHT. The dosages and treatment patterns were clear. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness evidence was derived from a review of published literature, and the source searched to identify the primary studies was reported. However, it was unclear whether a systematic review of the literature had been undertaken. Most of the primary studies were randomised and either investigator-masked or double-masked. Two of the
Publications grouped data from multiple trials. This ensured a high internal validity. Uncertainty around the efficacy was investigated in sensitivity analyses.

**Validity of estimate of measure of benefit**
The summary benefit measure was obtained directly from the effectiveness evidence. The use of percentage reduction in IOP as the summary benefit measure was appropriate in this study.

**Validity of estimate of costs**
The authors did not state explicitly which perspective was adopted in the study, although it appears that the costs relevant to the payer have been included in the analysis. The unit costs were presented separately from the quantities of resource used, which will aid replication of the analysis in other contexts. Resource consumption was derived from an authors’ assumption (one bottle equals one month of treatment). The authors acknowledged that the inclusion of the number of drops per bottle would have increased the apparent differences in cost-effectiveness between bimatoprost and the other medications. The costs were treated deterministically, although comprehensive sensitivity analyses were performed on the cost data to assess the robustness of the estimates used. The price year was reported, which aids reflation exercises in other settings. Discounting was not conducted and this was appropriate given the short time horizon.

**Other issues**
The authors compared their findings with those from other studies. The generalisability of the results of the analysis to other settings was not explicitly addressed. Sensitivity analyses on the drug costs and percentage reduction in IOP were conducted, which increases the external validity of the study. The authors acknowledged limitations of the study. For instance, it was assumed that one bottle of medication equalled one month of treatment. This would underestimate the difference in cost-effectiveness between bimatoprost and the other interventions. The use of early morning measurements biased the analysis against finding better cost-effectiveness with bimatoprost (or travoprost) compared with latanoprost. Pooling data from widely diverse studies may create bias given the variations in sample size and efficacy values among series of study data. Further, the costs of medication were estimated at a given point in time and did not reflect cost changes.

**Implications of the study**
The authors suggested that bimatoprost is a good choice for patients who want to minimise their risk of progression by reaching the lowest IOP possible at the lowest cost. In some individuals, bimatoprost may provide more pressure lowering than is necessary, and this should be taken into account if hyperaemia occurs and is bothersome.

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**Other publications of related interest**
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**MeSH**
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