Cost-effectiveness analysis of intracameral cefuroxime use for prophylaxis of endophthalmitis after cataract surgery

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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.

CRD summary
This study examined the cost and efficacy of various antibiotic preparations for the prevention of endophthalmitis after cataract surgery. The authors concluded that intracameral cefuroxime was relatively cost-effective. The lack of available data led to a theoretical evaluation of the other interventions, compared with intracameral cefuroxime, which was the only intervention with reliable data available. The efficacy threshold analysis suggests that the authors’ conclusions have merit, but without robust evidence the conclusions remain uncertain.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost and efficacy of various antibiotics for the prevention of endophthalmitis after cataract surgery.

Interventions
As prophylaxis, 11 antibiotic preparations were compared: intracameral cefuroxime 1mg per 0.1mL; subconjunctival cefazolin 100mg per mL; topical gatifloxacin 0.3%; topical moxifloxacin 0.5%; intracameral moxifloxacin 0.5%; topical ofloxacin 0.3%; topical ciprofloxacin 0.3%; topical polymyxin and trimethoprim; subconjunctival gentamicin 40mg per mL; topical sulfacetamide 10%; and combined treatment of intracameral cefuroxime, topical sulfacetamide, subconjunctival cefazolin, and subconjunctival gentamicin. These were compared with no intervention.

Location/setting
USA/secondary care.

Methods
Analytical approach:
This study was based on a decision-analytic model, for a hypothetical cohort of 100,000 patients aged 70 years or older, undergoing cataract surgery. Prophylaxis with intracameral cefuroxime was used as the reference standard to predict the threshold efficacy for other antibiotic therapies. This was achieved by calculating the efficacy that each treatment would need to have in order to achieve the same cost-effectiveness ratio as the reference standard. For these therapies, the model estimated the costs in the best-case scenario by assuming zero infection rates for patients receiving them. The analysis had a six-week time horizon and the authors stated that it was carried out from a societal perspective.

Effectiveness data:
There was limited clinical evidence available. The data for intracameral cefuroxime were from a large, prospective study. For no prophylaxis the authors made an assumption, based on published data. For the other antibiotic options, no published sources were available, and authors’ assumptions were used. The key clinical endpoint was the risk of endophthalmitis.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The results were presented as threshold effectiveness ratios, compared with intraacameral cefuroxime. The numbers of cases of endophthalmitis prevented were presented.

Cost data:
The economic analysis included the costs of antibiotics for prophylaxis, endophthalmitis treatment, and toxic anterior segment syndrome treatment. The acquisition costs of the antibiotic drugs were from US wholesale prices. The costs of the pharmacy technician's and registered nurse's time were based on the mean annual salary from the United States Bureau of Labor Statistics. The treatment costs were from literature. All costs were in US dollars ($) and the price year was 2007.

Analysis of uncertainty:
One- and two-way sensitivity analyses were conducted on a range of model inputs, including the antibiotic costs, treatment costs, and risk of infection.

Results
The cases of postoperative endophthalmitis prevented and the net costs were reported. Four of the treatment options were associated with savings in net costs and these were topical sulfacetamide, subconjunctival gentamicin, subconjunctival cefazolin, and intracameral cefuroxime.

When the treatment costs saved from cases of endophthalmitis prevented were excluded, the incremental cost-effectiveness ratio of intracameral cefuroxime over no intervention was $1,403 per case of endophthalmitis prevented. The efficacy required for each other option to achieve the same cost-effectiveness ratio was estimated. For example, to achieve an equivalent ratio, ciprofloxacin would have to be 8.79 times more effective than intracameral cefuroxime and ofloxacin would have to be 11.90 times more effective. The estimated incremental efficacy required for each treatment ranged from 0.81 times for topical sulfacetamide to 20.32 times for gatifloxacin.

The sensitivity analyses confirmed that these base-case findings were robust.

Authors' conclusions
The authors concluded that intracameral cefuroxime was relatively cost-effective in preventing endophthalmitis after cataract surgery.

CRD commentary
Interventions:
The selection of the comparators was appropriate in that they were commonly used for the prevention of postoperative endophthalmitis in the authors' setting.

Effectiveness/benefits:
No systematic review was reported to identify the relevant sources of data. The evidence for intracameral cefuroxime was from a prospective study, but its methods were not reported. Other sources of data were not fully reported, which makes it difficult to objectively assess the validity of the clinical estimates. Due to a lack of data, most treatments were assumed to have 100% efficacy and the analysis focused on the threshold ratio required to achieve a cost-effectiveness ratio comparable with that of intracameral cefuroxime, making this a theoretical analysis.

Costs:
The cost categories appear to have been consistent with the stated perspective; productivity costs were not included due to the age of the modelled population. The unit costs and resource quantities were not reported separately, which will limit the ability to replicate the study. Some data were derived from published studies, but the methods of these studies were not described.

Analysis and results:
Using intracameral cefuroxime as a reference standard to predict the threshold efficacy for the other antibiotic preparations was appropriate. The reporting was generally explicit, but caution is needed when interpreting the cost-effectiveness ratios for those interventions where 100% efficacy was assumed. The threshold effectiveness ratios
compared with the baseline drug are more informative. The uncertainty was assessed using deterministic sensitivity analysis. The assumptions for the clinical and cost inputs were appropriately described. The authors acknowledged some limitations of their study.

Concluding remarks:
The lack of available data led to a theoretical evaluation of these interventions, compared with intracameral cefuroxime, which was reported to be the only intervention with reliable data available. The efficacy threshold analysis suggests that the authors’ conclusions have merit, but without robust evidence the conclusions remain uncertain.

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