A cost-effectiveness analysis of three treatments for age-related macular degeneration
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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 evaluated the cost-effectiveness of pegaptanib sodium or ranibizumab injections, compared with photodynamic therapy (PDT) with verteporfin for treating choroidal neovascularisation in patients with age-related macular degeneration. The authors concluded that pegaptanib was inferior to PDT in costs and effectiveness and ranibizumab was unlikely to be cost-effective, at the accepted threshold of 50,000 US dollars per quality-adjusted life-year. The methods could not be assessed and there was no full incremental analysis. The authors’ conclusions should be interpreted with caution.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
This study aimed to evaluate the cost-effectiveness of pegaptanib sodium or ranibizumab injections compared with photodynamic therapy (PDT) with verteporfin for treating choroidal neovascularisation in patients with age-related macular degeneration.

Interventions
Pegaptanib sodium injections (0.3mg intravitreally every six weeks) and ranibizumab injections (0.5mg intravitreally every month) for two years were each compared with PDT using verteporfin (up to every three months), which was the usual care in the study setting.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A state-transition model was used to estimate the clinical and economic outcomes of the alternative treatments. The model was based on one reported in Sharma, et al. (2001, see ‘Other Publications of Related Interest’ below for bibliographic details). The model were evaluated three lesion types separately; predominantly classic, minimally classic, and occult with no classic lesions. The time horizon was two years and the authors stated that the perspective was that of the third-party payer.

Effectiveness data:
The effectiveness evidence was from randomised controlled trials that assessed the effectiveness of the treatments compared with control or sham treatment. The main clinical parameter was the visual acuity gain or loss measured by a gain or loss of 15 letters on a vision test. These trials also provided evidence for the frequency and dose of treatments.

Monetary benefit and utility valuations:
The utility estimates, for the clinical outcomes, were based on published time trade-off values. The disutilities associated with complications were from a combination of published values and expert opinion.

Measure of benefit:
The measure of benefit was the number of quality-adjusted life-years (QALYs), which were discounted at an annual rate of 3%.
Cost data:
The direct costs included those of treatment by an ophthalmologist, the drugs, and the complications. These costs were from the 2009 National Medicare Fee Schedule and the 2009 Medicare Drugs and Biologicals Fee Schedule. They were presented at 2009 prices and future costs were discounted at a rate of 3%. The currency was US dollars ($).

Analysis of uncertainty:
A series of one-way and multivariate sensitivity analyses was performed on a range of model parameters.

Results
The total discounted two-year cost of treatment was estimated to be $53,901 to $54,114 with ranibizumab, $22,203 to $22,290 with pegaptanib, and $8,486 to $11,217 with PDT with verteporfin.

The two-year discounted utilities associated with treatment were consistently lowest for sham injection (range 1.076 to 1.469) and highest for ranibizumab injection (range 1.174 to 1.540).

Ranibizumab was associated with the highest costs, but was also the most effective. The incremental cost-effectiveness of ranibizumab compared with sham injection ranged from $405,056 per QALY gained in patients with occult with no classic lesions and 20/80 visual acuity before treatment to $785,185 per QALY in patients with minimally classic lesions and 20/40 visual acuity before treatment. For patients with predominately classic lesions, compared with PDT, it ranged from $463,957, with 20/80 visual acuity to $776,073 with 20/40 visual acuity before treatment.

Authors' conclusions
The authors concluded that, compared with PDT, pegaptanib was inferior in costs and effectiveness and ranibizumab was unlikely to be cost-effective, at a threshold of $50,000 per QALY.

CRD commentary
Interventions:
The treatments were not described in detail, but the main comparator appears to have been the usual practice in the study setting. These comparators might be generalisable to other settings.

Effectiveness/benefits:
The effectiveness data were appropriate and from studies that appear to have been of good design. The authors stated that these were pivotal trials, but the method used to search the published literature was not described and it is not clear whether the best available evidence was used. The trials were not described, but their references were given. A two-year time horizon was considered and this might or might not have been sufficient to fully capture the differences in health outcomes and costs.

Costs:
The authors stated that the perspective was that of the third-party payer and the broad cost categories relevant to this perspective appear to have been included. The sources for cost estimates were relevant to the study population and were fully referenced, but only some of the resource use data were reported, within the cost calculations. Future costs were discounted appropriately and the details of the price year and currency were provided.

Analysis and results:
The analytic approach was not reported, which makes it difficult to fully appraise the model, but a reference was given for the study in which the original model was published (Sharma, et al. 2001) and this should be consulted to assess the relevance and appropriateness of its analytic approach for this study. The results were reported clearly and in full, but with little incremental analysis; if the interventions were valid comparators, a full incremental analysis would have been more appropriate. Sensitivity analyses were performed, but a probabilistic sensitivity analysis would have been better for assessing the full impact of uncertainty in the parameter estimates on the results. The authors discussed the limitations of their study.

Concluding remarks:
The methods could not be assessed and there was a lack of full incremental analysis. The authors' conclusions should be
interpreted with caution.

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