Cost-utility analysis of bevacizumab versus ranibizumab in neovascular age-related macular degeneration using a Markov model

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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
The objective was to assess the cost-effectiveness of bevacizumab and ranibizumab for choroidal neovascularisation, secondary to age-related macular degeneration. The authors concluded that bevacizumab was cost-effective, compared with ranibizumab. The methods appear to have been valid and the authors’ conclusions are appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of bevacizumab and ranibizumab, for choroidal neovascularisation, secondary to age-related macular degeneration (AMD).

Interventions
Monthly intravitreal injections of bevacizumab 1.25mg were compared with monthly injections of ranibizumab 0.5mg.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A Markov model, with three-month cycles, was developed to assess the cost-effectiveness of the two options in a hypothetical cohort of patients aged 65 years, with choroidal neovascularisation, AMD, and any type or size of lesion. The time horizon was 20 years and the authors reported that a US payer perspective was adopted.

Effectiveness data:
The effectiveness data were identified by a systematic literature review. PubMed was searched to identify clinical trials published up to September 2007, using keywords including ranibizumab and bevacizumab. The inclusion criteria were published trials; using one of the study drugs; in people aged 18 or older, with choroidal neovascularisation secondary to AMD; and with 20 patients or more. The key clinical endpoint was visual acuity.

Monetary benefit and utility valuations:
The utility values were from a published study that used the time trade-off method to elicit the utilities for AMD.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure.

Cost data:
The economic analysis included physician visits, drugs, and monitoring costs. The cost estimates for physician visits and monitoring were from the Veterans Affairs San Diego Healthcare System, Decision Support System and the Medicare National Physician Fee Schedule. Drug costs were based on their wholesale prices in the Red Book. The price year was 2007 and costs were reported in US $. Future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:
Monte Carlo simulation (with 1,000 iterations) was used to examine uncertainty in the model outputs, with beta
distributions for the transition probabilities and utilities, and gamma distributions for the costs. The results were presented using cost-effectiveness acceptability curves for various willingness-to-pay thresholds. One-way sensitivity analyses were carried out on the key inputs, including the transition probabilities, the utility weights, and the drug costs.

**Results**
Bevacizumab cost $30,349 per patient, while ranibizumab cost $220,649 per patient. Bevacizumab produced an estimated 21.60 QALYs, while ranibizumab produced 18.12 QALYs. Bevacizumab dominated ranibizumab, as it was less costly and more effective.

The one-way sensitivity analysis showed that the results were most sensitive to variations in the drug costs. The likelihood of bevacizumab being cost-effective, compared with ranibizumab, was 95% at a willingness-to-pay threshold of $50,000 per QALY gained.

**Authors’ conclusions**
The authors concluded that bevacizumab was cost-effective, compared with ranibizumab.

**CRD commentary**

**Interventions:**
Sufficient details of the treatment options were provided. While bevacizumab had been shown to be effective in preventing visual acuity loss, it was not approved in the USA for the treatment of choroidal neovascularisation secondary to AMD.

**Effectiveness/benefits:**
The effectiveness data were identified by a systematic literature review, which should ensure that the most up-to-date and relevant evidence was used. An inclusion criterion for studies was that they were published clinical trials, but few details of the chosen studies were reported making it difficult to assess their validity. QALYs were an appropriate outcome measure, capturing the impact of the interventions on length and quality of life and allowing comparisons with other studies. It was unclear if future QALYs were discounted, which would have been appropriate given the 20-year time horizon.

**Costs:**
The perspective was stated and relevant costs were included. The sources for the cost estimates were reported and appear to have been appropriate. The sources for the resource use data were unclear. The price year and discounting were reported.

**Analysis and results:**
The results of the analysis were clearly presented and discussed. Both deterministic and probabilistic sensitivity analyses were carried out to investigate uncertainty, and the methods and results were clearly reported and discussed. The authors acknowledged some limitations to their analysis, which mainly related to the lack of efficacy data. The results should be generalisable to similar settings.

**Concluding remarks:**
The methods appear to have been valid and the authors’ conclusions are appropriate.

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Not stated.

**Bibliographic details**

**PubMedID**