Cost-effectiveness of ranibizumab for neovascular age-related macular degeneration
Hurley S F, Matthews J P, Guymer R H

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 study objective was to assess the cost-effectiveness of ranibizumab (RAN) for the treatment of age-related neovascular macular degeneration in comparison with usual care. The authors concluded that RAN was more effective and less expensive than usual care from the perspective of society, while from the health care payer's viewpoint, it was cost-effective only when it cost less than $1,000 per dose. The study was, in general, well conducted and well presented. The authors’ conclusions appear valid.

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

Study objective
The objective was to assess the cost-effectiveness of ranibizumab (RAN) for the treatment of age-related neovascular macular degeneration in comparison with the current standard treatment. The patients were aged between 67 and 77 years.

Interventions
The strategy of RAN was compared with the current standard of care, which did not include RAN. RAN was given at a dosage of 0.5 mg per month.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A Markov model was developed in order to simulate the progression of disease under the two treatment scenarios. The time horizon of the analysis was 10 years. The authors stated that the study was conducted from the perspectives of society and the health care payer.

Effectiveness data:
The clinical data were derived from a selection of known relevant studies. Data on the effectiveness of RAN over the first 2 years of treatment were obtained from a published randomised clinical trial (RCT), the MARINA study (the Minimally Classic/Occult Trial of the Anti-VEGF Antibody Ranibizumab in the Treatment of Neovascular Age-Related Macular Degeneration). Patient characteristics at baseline and transition probabilities without RAN were also obtained from the MARINA study. After the first 2 years, several assumptions were made in order to simulate the effectiveness of treatment. Specifically, three hypothetical scenarios were considered. In one, the efficacy of RAN was maintained for 2 additional years after the first 2 years demonstrated in the trial (base-case scenario). In another, the efficacy of RAN was sustained after 4 years of treatment (sustained scenario). In the third, the efficacy of RAN was limited to the first 2 years of treatment (non-sustained scenario) and then visual acuity would decline. The mortality data came from US life tables. Other data came from a published study, details of which were not given.

Monetary benefit and utility valuations:
Utility valuations were derived from a published study that used the time trade-off approach in 81 US patients with macular degeneration and vision loss.

Measure of benefit:
The summary benefit measures were the quality-adjusted life-years (QALYs), blindness rate and blind years. These were all estimated using the modelling framework. QALYs and blind years were discounted at an annual rate of 3%.

Cost data:
The cost categories included in the analysis were RAN (acquisition and administration), medical care for age-related macular degeneration, medical care attributable to vision loss, and care giving by family, friends and professional carers. Medical care costs were mainly derived from Medicare files. Resource use for care giving was obtained from a published survey of 803 patients. The hourly cost of care was obtained from the Bureau of Labour and Statistics. The costs were in US dollars ($). The price year was 2004. An annual discount rate of 3% was applied to future costs.

Analysis of uncertainty:
Several scenarios were considered beyond the three cases related to treatment efficacy. These were changes in the age of the cohort (starting age 67 or 77 years), different time horizons (2 years or 10 years), different RAN acquisition costs and the inclusion or exclusion of care giving costs. In particular, the cost of the drug varied between the RAN wholesale price and the far cheaper price of bevacizumab (BEV), a similar molecule which might be equally efficacious. A first-order Monte Carlo simulation was also performed.

Results
Over a 10-year time horizon, in a hypothetical 67-year-old woman, the expected QALYs for RAN versus no RAN increased from 4.9 to 5.58 in the base-case (5.69 in the sustained scenario and 5.45 in the non-sustained scenario). Similarly, the expected number of blind years were reduced from 3.61 to 1.61 (base-case), 1.27 (sustained-effect scenario) or 2.03 (non-sustained effect scenario).

The expected costs from a societal perspective over 10 years were $205,800 with RAN and $238,300 with usual care. Given the improvement in all benefit measures, RAN was the dominant strategy since it was simultaneously more effective and less expensive. Clearly the result held also when BEV price was used.

When excluding caregiver costs (perspective of the health care payer), RAN led to $62,400 additional costs ($3,800 with BEV price) over usual care. This resulted in an incremental cost per QALY gained of $91,900 ($5,600 with BEV price) over 10 years.

Similar findings were achieved in the non-sustained scenario, while more favourable results were observed in the sustained case ($20,300 per QALY assuming wholesale price).

Much less favourable results were obtained with a 2-year time horizon where, even when including caregivers costs, the incremental cost per QALY for RAN versus no RAN was over $300,000 when assuming the wholesale price (but was dominant when the BEV price was used).

The sensitivity analysis suggested that, from the health care payer perspective, RAN treatment reached a threshold cost-effectiveness of $50,000 per QALY at about $1,000 per dose over 10 years, $300 per dose over 4 years, and just less than $50 over a 2-year timeframe.

Authors' conclusions
The authors concluded that RAN was a dominant strategy (more effective and less expensive than usual care) from the perspective of society, while from the health care payer's viewpoint it was cost-effective only when it cost less than $1,000 per dose.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear since the new treatment (RAN) was compared to usual care. However, usual care was not described, which limits the possibility of judging its relevance in other health care settings.

Effectiveness/benefits:
The authors justified their selection of the MARINA study from which to derive clinical data on treatment effectiveness over the first 2 years. Thus, the selective use of this RCT should have been appropriate. The design of the study ensures the validity of the clinical data. Other clinical inputs were derived from published sources, which were not described in depth. The uncertainty about the effectiveness of RAN beyond the trial observation period was appropriately investigated for three potential scenarios, which were clearly described and discussed. The derivation of the three benefit measures was clear. In particular, QALYs are a validated measure of the impact of treatment on patient health and are also comparable with the benefits of other health care interventions.

**Costs:**
The use of two different perspectives was appropriate since this makes the analysis interesting for different payers. Accordingly, all possible costs were included in the analysis, depending on the point of view. The costs were presented as macro-categories and a detailed breakdown of the cost items was not provided. This partly reduces the transparency of the whole economic analysis. The price year and the use of discounting were appropriately reported. The sensitivity analysis investigated the implications of using an alternative drug with a substantially lower acquisition price.

**Analysis and results:**
The synthesis of the costs and benefits was clear. The sensitivity analysis addressed the key areas of uncertainty, the main findings of which were presented clearly. A simplified structure of the decision model was depicted and the model was extensively described in terms of health states and transition probabilities.

**Concluding remarks:**
The study was generally well conducted, with a clear presentation of the sources used and the assumptions required in the decision model. The authors’ conclusions were reported clearly and appear valid.

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**Bibliographic details**

**Other publications of related interest**


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