Historical clinical and economic consequences of anemia management in patients with end-stage renal disease on dialysis using erythropoietin stimulating agents versus routine blood transfusions: a retrospective cost-effectiveness analysis

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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 the routine administration of erythropoietin-stimulating agents for anaemia in patients with end-stage renal disease. The authors concluded that erythropoietin-stimulating agents appeared to be cost-effective. The methods were good and the results were reported adequately. Given the scope of the analysis, the authors’ conclusions appear to be appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of the routine administration of erythropoietin-stimulating agents, for anaemia in patients with end-stage renal disease.

Interventions
Erythropoietin-stimulating agents were compared with usual care, which was routine blood transfusions at home.

Location/setting
USA/out-patient secondary care.

Methods
Analytical approach:
A Markov cohort model was developed to assess the cost-effectiveness of erythropoietin-stimulating agents, relative to routine blood transfusions, for the management of anaemia. The time horizon was 10 years, from 1995 to 2004. The authors stated that the perspective of the third-party payer (Medicare) was adopted.

Effectiveness data:
The clinical and effectiveness data were from published studies and the US Renal Data System (USRDS). A systematic review of the literature was performed to update a review of erythropoietin-stimulating agents, conducted by the UK National Institute for Health and Clinical Excellence (NICE) in 2006 (see Other Publications of Related Interest). MEDLINE, EMBASE, and The Cochrane Library were searched to identify recent evidence on the relationship between haemoglobin and clinical outcomes. The main clinical effectiveness estimates were the relative risk of death, the likelihood of transplantation, and the incidence of iron overload requiring iron chelation.

Monetary benefit and utility valuations:
The utility estimates were from published studies.

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

Cost data:
The direct costs included those of hospitalisations, transfusion, erythropoietin-stimulating agents, and iron chelation. In a sensitivity analysis the authors included the costs of the treatment of hepatitis B and C infections, and the treatment of
delayed haemolytic reactions. In-patient and out-patient resource use and unit cost data were from the USRDS. Other unit costs were from published studies. The price year was 2008 and all costs were reported in US $.

Analysis of uncertainty:
One-way sensitivity analyses were undertaken by varying the baseline estimates, within plausible ranges. A probabilistic sensitivity analysis was performed to assess the impact on the results of variations in all the model parameters (except for those obtained from the USRDS) at the same time. The results were presented on a cost-effectiveness acceptability curve and a cost-effectiveness plane.

Results
The total costs incurred by all patients with end-stage renal disease, over 10 years, were $155,465,690,425 with erythropoietin-stimulating agents, and $155,223,282,747 with transfusions. The total QALYs gained were 2,563,537 with erythropoietin-stimulating agents, and 2,285,865 with transfusions.

Compared with transfusions, the incremental cost per QALY gained with erythropoietin-stimulating agents was $873.

The probabilistic sensitivity analysis showed that erythropoietin-stimulating agents were cost-effective, compared with transfusions, in 81% of simulations, at a willingness-to-pay threshold of $50,000 per QALY gained.

Authors' conclusions
The authors concluded that erythropoietin-stimulating agents appeared to be cost-effective at commonly accepted levels of willingness to pay.

CRD commentary
Interventions:
The interventions were adequately described, and the usual practice in the US was included (blood transfusions).

Effectiveness/benefits:
The clinical and effectiveness data were from published studies and the USRDS. The published studies were identified by a systematic review of the literature, undertaken for a NICE report published in 2006, which was updated. Details of the review were provided, including the sources searched and the inclusion criteria, with further information and findings in an appendix. It is likely that all relevant major evidence was assessed for inclusion into the model. QALYs were an appropriate benefit measure, as they capture the impact of the intervention on survival and quality of life, as well as allowing comparisons with other interventions for other diseases. The sources and derivation of the utility weights were provided. The authors did not state whether future QALYs were discounted, and this was relevant, given the 10-year time horizon.

Costs:
For the stated Medicare perspective, it appears that all the major relevant costs were included. It was implicitly assumed that the costs of treating infections were included in the costs from the USRDS, so these costs were not added for the main analysis, but their impact was assessed in the sensitivity analysis. The sources for the unit costs and resource use were reported. The authors explicitly reported the price year, time horizon and currency. The costs could be incurred over 10 years, but no discounting of costs incurred past the first year was reported.

Analysis and results:
A decision analytic model was used to synthesise the cost and outcome information. The details of the model structure were reported, with a diagram. The impact of uncertainty on the model's results was assessed in one-way and probabilistic sensitivity analyses. The authors reported that one of the main limitations of their study was its reliance on observational data, due to the few randomised studies available on erythropoietin-stimulating agents.

Concluding remarks:
The methods were good and the results were reported adequately. Given the scope of the analysis, the authors' conclusions appear to be appropriate.
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