Cost-effectiveness of recombinant human erythropoietin in the prevention of chemotherapy-induced anaemia

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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.

Health technology
Recombinant human erythropoietin (rHuEPO) in the prevention of chemotherapy-induced anaemia.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
A hypothetical, typical patient who receives treatment at a mean age of 65 years, does not carry any other cause for anaemia except cancer chemotherapy, always has an expected survival of more than 6 months and is treated with rHuEPO when haemoglobin falls below 10.7 g dl-1.

Setting
Hospital. The study was carried out in Pavia, Italy.

Dates to which data relate
Effectiveness data were collected from studies published between 1985 and 1997. Resource use and cost data were collected from studies published between 1995 and 1996. The price year was not reported.

Source of effectiveness data
Effectiveness data were derived from a review of the literature.

Modelling
A decision analytic model was used to determine the cost-utility of the two clinical management strategies.

Outcomes assessed in the review
The review assessed the response to rHuEPO treatment and the risk of blood-borne infections.

Study designs and other criteria for inclusion in the review
Baseline data on the effectiveness of secondary prophylaxis were derived from randomised controlled trials. For cisplatin-treated patients, the rHuEPO response rate was derived from a prospective, randomised, double-blind, placebo-controlled trial. Post-hepatitis outcomes were derived from a prospective, population-based study.
Sources searched to identify primary studies
Sources were identified through repeated computer searches of the MEDLINE medical literature and from the reference list of relevant papers.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Summary statistics from each study were used.

Number of primary studies included
Approximately 13 studies were included in the review.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
For patients treated with any chemotherapy, the probability of transfusions was 10.4% with rHuEPO and 21.9% without rHuEPO. The number of units of RBC per month was 0.29 with rHuEPO and 0.55 without rHuEPO. The probability of improvement of anaemia in transfused patients was 57.7% and non-transfused patients 31.1%, with rHuEPO.

For patients treated with cisplatin-containing chemotherapy, the probability of transfusions was 53.1% with rHuEPO and 68.9% without rHuEPO. The number of units of RBC per month was 1.16 with rHuEPO and 1.34 without rHuEPO. The probability of improvement of anaemia was 48.4% with rHuEPO.

The risk of post-transfusion HCV hepatitis was 0.004% and death from acute hepatitis was 2.5%.

The probability of chronic persistent hepatitis per year was 0.93% and chronic active hepatitis per year was 1.04%.

The probability of cirrhosis per year was 1.32%, hepatocarcinoma per year was 0.24% and death per year was 0.59%.

Measure of benefits used in the economic analysis
Quality Adjusted Life Years (QALYs) were used as the measure of benefits. At baseline, the authors used the overall Quality of Life score, provided on a visual analogue scale by the patients of a community oncology study. Adjustments for the Quality of Life related to post-transfusional hepatitis and HIV infection were derived from the literature. Benefits were discounted at a rate of 3% per year.

Direct costs
Direct costs were discounted at a rate of 3% per year. Quantities and costs were not reported separately. Direct costs included the cost of rHuEPO therapy, the cost of blood transfusions and the cost of treating the adverse effects related to transfusions. The quantity/cost boundary adopted was that of the hospital. The estimation of quantities and costs was based on actual data. Resource use and cost estimates were derived from published studies. The price year was not
Statistical analysis of costs
Not reported.

Indirect Costs
Not included.

Currency
US dollars ($).

Sensitivity analysis
A sensitivity analysis was performed on the estimates used in the decision model.

Estimated benefits used in the economic analysis
Saving RBC transfusions by rHuEPO administration increases quality adjusted life expectancy by 8.4 days.

Cost results
The average cost of adding rHuEPO to transfusions ($4,568) was $4,362 greater than that of RBC transfusions alone ($206).

Synthesis of costs and benefits
The incremental cost-utility of secondary prophylaxis with rHuEPO supplemented with RBC transfusions over conventional treatment with RBC transfusions alone was $189,652 per QALY. These results were sensitive to changes in the price and the efficacy of rHuEPO, but were stable with regard to variations in the probability of blood-borne infections, quality of life of responding patients and cancer-related mortality.

Authors' conclusions
According to current use, rHuEPO is not cost-effective in the treatment of chemotherapy-induced anaemia. More tailored utilisation of the drug and better consideration of predictive response indicators may lead to an effective, blood-sparing alternative.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. You, as a user of this database, should verify whether these health technologies are relevant to your setting.

Validity of estimate of measure of benefit
A relevant measure of benefit was used. Quality of life scores and baseline estimates on the efficacy of secondary prophylaxis for anaemia with rHuEPO were derived from a single community-based study. The review of the literature was comprehensive but the authors note that, where results were equivocal, values were assigned which tended to bias the results in favour of rHuEPO. The authors did not consider side-effects from rHuEPO therapy such as hypertension and thrombosis, the immunomodulating effects of allogeneic transfusions, or the possible long-term effects of transfusional therapy caused by blood-borne infections. The authors did not examine the use of rHuEPO in primary prophylaxis.
Validity of estimate of costs
Only direct costs were included. Indirect costs, such as costs arising from lost productivity, were not considered. To obtain a more reasonable comparison, costs of rHuEPO need to be compared with the costs that would be incurred if sufficient blood transfusion was used to mimic the steady haemoglobin level achieved with rHuEPO in patients who respond to the therapy. The cost of both iron replacement during rHuEPO and of iron chelation during transfusion therapy was not included.

Other issues
Adequate comparisons with other relevant studies were made. The generalisability of the results to other settings or countries was not discussed. The authors do not appear to have presented their results selectively. The study enrolled patients with chemotherapy-induced anaemia of cancer and this was reflected in the authors' conclusions.

Implications of the study
A prospective trial on the use of rHuEPO limited to patients who have the characteristics that predict the response to the drug is warranted.

Source of funding
None stated.

Bibliographic details
Barosi G, Marchetti M, Liberato N L. Cost-effectiveness of recombinant human erythropoietin in the prevention of chemotherapy-induced anaemia. British Journal of Cancer 1998; 78(6): 781-787

PubMedID
9743301

Original Paper URL
http://www.churchillmed.com/Journals/BJC/prev.html

Other publications of related interest
1. Barosi G, Liberato N L. The cost-effectiveness of rHuEPO use in anaemia of cancer. In: Smyth J F, Boogaerts M A, Ehmer B R-M. rhErythropoietin in cancer supportive treatment. New York:M Dekker, 1996:45-57.
2. Sheffield R E, Sullivan S D, Saltiel E, Nishimura L. Cost comparison of recombinant human erythropoietin and blood transfusion in cancer chemotherapy-induced anaemia. Annals of Pharmacotherapy 1997;31:15-22.

Indexing Status
Subject indexing assigned by NLM

MeSH
Aged; Anemia /chemically induced /prevention & control; Antineoplastic Agents /adverse effects; Blood Transfusion /adverse effects; Cost-Benefit Analysis; Decision Support Techniques; Erythropoietin /economics /therapeutic use; Hepatitis C /epidemiology /transmission; Humans; Quality-Adjusted Life Years; Recombinant Proteins

AccessionNumber
21998001384

Date bibliographic record published
30/06/2000
Date abstract record published
30/06/2000