The cost-effectiveness of treatment with erythropoietin compared to red blood cell transfusions for patients with chemotherapy induced anaemia: 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
Epoetin alfa was compared with red blood cell transfusion for the treatment of chemotherapy-induced anaemia in cancer patients. The authors concluded that epoetin alpha was within acceptable cost-effectiveness thresholds at a haemoglobin target level of 12g per dL, but was not as cost-effective when the target level was set at 13g per dL. The study was characterised by some limitations, some of which were highlighted by the authors. The conclusions should be considered with these limitations in mind.

Type of economic evaluation
Cost-utility analysis

Study objective
This study compared two management options for the treatment of chemotherapy-induced anaemia.

Interventions
The treatments were epoetin alfa, combined with red blood cell transfusion (RBCT) if the haemoglobin level was below 10g per dL, and RBCT alone.

Location/setting
Sweden/secondary care.

Methods
Analytical approach:
A Markov model with a one-year time horizon was used. This was slightly modified from a model developed by the National Institute for Health and Clinical Excellence (NICE, Wilson, et al. 2007, see ‘Other Publications of Related Interest’ below for bibliographic details). The authors stated that the perspective was that of the Swedish health care system.

Effectiveness data:
The data on response rates for the two interventions were taken from a Swedish multi-centre observational study. This study included 59 patients who developed chemotherapy-related anaemia; 29 received epoetin alfa and 30 received darbepoetin alfa. The data for the other model parameters were taken from the published NICE model. The main clinical parameters included the response to treatment (single dose first attempt, single dose second attempt, and double dose for non-responders), survival, and mortality.

Monetary benefit and utility valuations:
The utility values were obtained from the NICE model. The authors reported that they were derived using the time trade-off method.

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

Cost data:
The direct costs included the costs of pharmaceuticals, hospitalisation, and out-patient visits. The cost data were
obtained from official published sources. They were converted from Swedish kronor (SEK) to Euros (EUR) at an exchange rate of SEK 9.1994 equals EUR 1. The price year was 2007.

Analysis of uncertainty:
The parameter uncertainty was investigated using one-way sensitivity analysis on the following model parameters: the haemoglobin level under which RBCT was initiated, epoetin alfa treatment haemoglobin target level, haemoglobin level rise per cycle after chemotherapy completion, initial patients’ haemoglobin levels, and epoetin alfa double dose for non-responders.

Results
In the base case, with haemoglobin levels of 10g per dL, epoetin alfa treatment resulted in 0.5687 expected QALYs and RBCT resulted in 0.5334 QALYs. The total costs were EUR 3,750 with epoetin alfa and EUR 2,881 with RBCT. The incremental cost-effectiveness ratio for epoetin alfa was EUR 24,700 per QALY gained.

Alternative epoetin alfa and RBCT strategies were analysed. The RBCT strategies differed in their trigger points (9, 10, and 11g per dL) and the epoetin alfa targets were high (13g per dL) or low (12g per dL). The results showed that the marginal effect on QALYs decreased for each trigger point step, whilst the marginal increase in costs remained fairly constant.

Authors’ conclusions
The authors concluded that at a haemoglobin target level of 12g per dL, epoetin alfa treatment was within acceptable thresholds for incremental cost per QALY gained compared with RBCT alone, but when the target level was raised to 13g per dL, the incremental cost per QALY gained became very high.

CRD commentary
Interventions:
The interventions were clearly reported, but other interventions were available, such as epoetin beta or darbepoetin alfa, and were not considered. It is not clear what impact the inclusion of these additional interventions would have had on the incremental results.

Effectiveness/benefits:
The clinical response data were derived from a single observational study with Swedish patients; all the other data were taken from the NICE model. A full critique of the model inputs is not possible as they were not presented in this paper. The Swedish study was reported in slightly more detail and it appears to have been an appropriate source of evidence, but the limitations of its observational design need to be considered. The derivation of the benefit measure was stated to be by time trade-off, but no details were presented; these were presumably reported in the NICE publication. QALYs are an appropriate benefit measure allowing cross-disease comparisons to be made.

Costs:
The costs and their sources reflected the perspective stated. The costs and resource quantities were reported separately, which enhances the transparency of the economic analysis. The price year was reported, facilitating future reflation exercises. The uncertainty around the cost estimates and resource use was not investigated in sensitivity analysis, which limits the generalisability of the findings.

Analysis and results:
The model structure and the modelling assumptions were clearly reported. The synthesis of the costs and benefits was appropriately carried out using an incremental approach. The issue of uncertainty was addressed deterministically, through alternative scenarios, and validated using alternative Swedish data. These methods go some way towards assessing uncertainty, but a probabilistic analysis, considered to be the gold standard by many health economists, could have more thoroughly assessed the parameter uncertainty. The authors compared their results with those published by NICE and highlighted some differences. They discussed some limitations of their study, mainly in relation to the cost data used. Overall, the reporting was clear and the methodology was adequate.

Concluding remarks:
The study was characterised by some limitations, some of which were highlighted by the authors. The conclusions should be considered with these limitations in mind.

**Funding**
Funded by a grant from Janssen-Cilag, Sweden.

**Bibliographic details**

**PubMedID**
18770060

**DOI**
10.1080/02841860701744498

**Original Paper URL**
http://informahealthcare.com/doi/abs/10.1080/02841860701744498

**Other publications of related interest**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adult; Aged; Anemia, Hypochromic /blood /chemically induced /economics; Antineoplastic Agents /administration & dosage /adverse effects; Cost-Benefit Analysis; Epoetin Alfa; Erythrocyte Transfusion /adverse effects /economics; Erythropoietin /economics /therapeutic use; Female; Hematinics /economics /therapeutic use; Hemoglobin /metabolism; Humans; Male; Markov Chains; Middle Aged; Quality of Life; Quality-Adjusted Life Years; Recombinant Proteins; Severity of Illness Index; Sweden

**AccessionNumber**
22008101796

**Date bibliographic record published**
02/03/2009

**Date abstract record published**
27/01/2010