Economic evaluation of plerixafor for stem cell mobilization

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
This study evaluated the cost-effectiveness of plerixafor, with granulocyte-colony stimulating factor, for stem cell mobilisation, in patients with diffuse large B-cell lymphoma, who were undergoing haematopoietic stem cell transplantation. The authors concluded that the addition of plerixafor was cost-effective. The authors’ conclusions were not sufficiently cautious, given the study’s reporting and the evidence limitations.

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

Study objective
This study evaluated the cost-effectiveness of plerixafor, with granulocyte-colony stimulating factor, for stem cell mobilisation, in patients with diffuse large B-cell lymphoma, who were undergoing haematopoietic stem cell transplantation.

Interventions
Plerixafor, with granulocyte-colony stimulating factor, was compared with granulocyte-colony stimulating factor with placebo. The treatment schedule was that used in a phase III trial of plerixafor. Patients were given 10 micrograms (μg) per kg of granulocyte-colony stimulating factor, for up to eight days, stem cell transplantation started on day four, with up to four days of either 240μg/kg plerixafor or placebo.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A probabilistic micro-simulation state transition model was used to synthesise the data from a small phase III randomised controlled trial, with long-term evidence from published literature. The model had three parts: a Markov model of the collection of stem cells, with a cycle of one apheresis session; the engraftment process; and a Markov model of the time after engraftment, with one-year cycles. The time horizon was lifetime, and the authors stated that the study perspective was societal.

Effectiveness data:
The clinical effectiveness evidence was from a randomised controlled phase III trial of 20 patients with diffuse large B-cell lymphoma, the most common type of non-Hodgkin's lymphoma, who were given plerixafor or placebo, at the Washington University School of Medicine. The data for after engraftment were from published sources. The main clinical effectiveness estimate was the probability of successful engraftment.

Monetary benefit and utility valuations:
The utility values were from a published European study of patients with non-Hodgkin's lymphoma, who were undergoing autologous stem cell transplantation. The utility scores were assigned for patients undergoing apheresis, having high dose chemotherapy, and after engraftment.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary measure of benefit. Another measure was the number of patients progressing to autologous stem cell transplantation (with a payer perspective). Future benefits were discounted
at a rate of 3% per year.

Cost data:
The costs for those undergoing transplantation (stem cell collection and engraftment) were calculated by applying Medicare charges to the resource use of patients in the phase III trial. The costs after engraftment were estimated from hospital financial data or expert opinion. The cost categories were hospital admission, treatment (apheresis and stem cell infusion), medical staff, and the drugs. All costs were in US $, and future costs were discounted at a rate of 3% per year.

Analysis of uncertainty:
The authors conducted one-way and probabilistic sensitivity analyses to assess the impact of uncertainty on the results. The results of the probabilistic sensitivity analysis were presented in cost-effectiveness acceptability curves.

Results
Granulocyte-colony stimulating factor alone resulted in a mean total of 5.05 QALYs. With the addition of plerixafor, it resulted in 6.80 QALYs; a gain of 1.75 QALYs. Granulocyte-colony stimulating factor alone was estimated to cost $67,730, and with plerixafor it cost $93,180; an incremental cost of $25,450.

The incremental cost-effectiveness ratio with plerixafor was estimated to be $14,574 per QALY gained.

In one-way sensitivity analysis, the most influential variables were those relating to stem cell mobilisation. Probabilistic sensitivity analysis showed that at a willingness-to-pay for a QALY of $36,000, the likelihood of cost-effectiveness was close to 100%.

Authors’ conclusions
The authors concluded that plerixafor, added to granulocyte-colony stimulating factor, for stem cell mobilisation, in patients with relapsed diffuse large B-cell lymphoma, was cost-effective.

CRD commentary
Interventions:
The description of the interventions was acceptable, but it was unclear whether there were other alternatives available. It was unclear whether the doses, which were based on a small randomised trial, were those used, in practice, in the study setting.

Effectiveness/benefits:
The main evidence was from 20 patients in a phase III randomised controlled trial. This trial was described, but the length of follow-up and analysis methods were not reported. The methods used to identify, select, and analyse the data from the published studies, that supplied the long-term data, were not described in detail. It was not clear if the best available evidence was used. The effectiveness of each treatment was based on 10 patients, who might not have been representative of all patients, and many events had no occurrences, which might not have happened with a larger sample. The methods used to derive the utilities for the QALYs were not reported, making it difficult to assess their validity and generalisability.

Costs:
The costs appear to have included only the direct costs of hospital treatment, which was not consistent with the societal perspective stated. The authors used Medicare charges, indicating the costs to the payer, rather than society. Key information, such as the price year and any cost adjustments, was not reported. The discounting of future costs was appropriate.

Analysis and results:
The methods and distributions for the micro-simulation model were sufficiently reported. The methods of the probabilistic sensitivity analysis were not reported; it was unclear which inputs were varied, and how the analysis was conducted. The authors indicated that there was considerable uncertainty around the trial data, due to its size, but they only superficially acknowledged these limitations in their conclusions.
Concluding remarks:
The authors’ conclusions were not sufficiently cautious, given the study’s reporting and the evidence limitations.

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