Pharmacoeconomic analysis of oprelvekin (recombinant human interleukin-11) for secondary prophylaxis of thrombocytopenia in solid tumor patients receiving chemotherapy.

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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
The use of oprelvekin (recombinant human interleukin-11, rhIL-11) for the treatment of thrombocytopenia among cancer patients. In the clinical trial on which this economic evaluation was based, oprelvekin was administered at a dose of 50 mg/kg per day for 14 days.

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised adult patients with solid tumours or lymphoma, who were receiving chemotherapy, and who had a demonstrated risk of thrombocytopenia. The patients had already received platelet transfusion due to an episode of severe chemotherapy-induced thrombocytopenia during a prior chemotherapy cycle.

Setting
The setting was a hospital. The economic study was conducted at the University of Texas M.D. Anderson Cancer Center, Houston (TX), USA.

Dates to which data relate
The dates to which the effectiveness and resource use data related were not reported. The price year was 1997.

Source of effectiveness data
The effectiveness evidence was derived from completed studies and authors' assumptions.

Modelling
A decision-analytic model was constructed to evaluate the costs of the two strategies under examination. The structure of the tree was reported graphically. The two main branches of the tree were similar. The patients could experience major (syncope or atrial fibrillation) or minor (oedema) adverse events.

Outcomes assessed in the review
The health outcomes assessed from the literature were the probabilities of transfusion and the rate of major (syncope or atrial fibrillation) or minor (oedema) adverse events.
Study designs and other criteria for inclusion in the review
The authors did not describe the design of the primary study but, from the title of the reference, it appears to have been a randomised placebo-controlled trial.

Sources searched to identify primary studies
Not stated.

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

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
The effectiveness evidence came from only one primary study (see Other Publications of Related Interest).

Methods of combining primary studies
Not relevant.

Investigation of differences between primary studies
Not relevant.

Results of the review
Transfusion was required in 70.4% of the patients treated with rhIL-11 and 96.3% of those treated with usual care. Subsequently, the mean number of units transfused for those patients who required transfusion was calculated to be 20 with rhIL-11 and 21.5 with usual care.

Eleven of the 58 patients who received rhIL-11 developed major adverse events versus 1 of the 30 patients who received usual care.

Minor adverse events occurred in approximately 60% of the patients in the rhIL-11 group and in 15% of those in the usual care group.

Methods used to derive estimates of effectiveness
The authors made a key assumption about the effectiveness of the study treatments.

Estimates of effectiveness and key assumptions
It was assumed that there was no statistically significant difference between the two study interventions in terms of their effectiveness in the prevention of prolonged and profound thrombocytopenia.

Measure of benefits used in the economic analysis
No summary benefit measure was used in the economic analysis because the authors assumed that the two treatments were equally effective. Thus, a cost-minimisation analysis was conducted.
**Direct costs**
Discounting was not performed because the costs per patient were incurred over a short time. The unit costs were only reported separately from the quantities of resources used for a few cost items. The health services included in the economic evaluation were drugs, treatment of major or minor adverse events, platelet transfusions (including platelets, supplies, laboratory tests and clinical personnel) and the treatment of transfusion reactions. The costs of leukocyte depletion and the treatment of viral infections were negligible, and were not included. The cost/resource boundary adopted in the study was that of the health service payer. Resource use was estimated on the basis of the authors’ assumptions and a published study (see Other Publications of Related Interest). The unit costs were derived from the wholesale prices for the study drugs and other medications and data coming from the University of Texas M.D. Anderson Cancer Center. The costs were reflated to 1997 values using the medical care component of the consumer price index.

**Statistical analysis of costs**
The costs were treated deterministically in the base-case.

**Indirect Costs**
The indirect costs were not included in the economic analysis.

**Currency**
US dollars ($).

**Sensitivity analysis**
One-way sensitivity analyses were conducted to evaluate how variations in the model parameters would affect the robustness of the estimated costs of the two interventions. Almost all of the model inputs were varied.

**Estimated benefits used in the economic analysis**
See the 'Results of the Review' section.

**Cost results**
The expected number of units of transfused platelets was 20.8 with usual care and 14.1 with rhIL-11 (difference of 6.7 favouring rhIL-11).

The expected costs were $3,495 with usual care and $5,320 with rhIL-11 (difference of $1,834 favouring usual care). This conclusion was robust to most of the sensitivity analyses.

The expected costs of rhIL-11 would be comparable to those associated with usual care only if the probability of transfusion with rhIL-11 dropped to 0.140 (it was 0.704 in the base-case).

Similarly, the price of rhIL-11 would have to decrease substantially (from $181 to $50 per vial) for the two strategies to be equally costly.

**Synthesis of costs and benefits**
Not relevant because a cost-minimisation analysis was conducted.

**Authors’ conclusions**
The cost-savings associated with the reduced number of units of transfused platelets did not offset the high costs of rhIL-11 in comparison with usual care.
CRD COMMENTARY - Selection of comparators

The rationale for the choice of the comparator was clear. Transfusion performed at a threshold of less than 20,000 platelets/microL was selected as the basic comparator, because it represented the standard approach used to prevent thrombocytopenia. You should decide whether it represents a valid comparator in your own setting.

Validity of estimate of measure of effectiveness

The analysis of effectiveness was mainly based on the authors' assumption of the lack of a statistically significant difference between the two treatments. This assumption was made on the basis that no study had demonstrated a statistically significant superiority in clinical outcomes for rhL-11, compared with platelet transfusion alone. Other health outcome measures were estimated from a completed study and were used as probability values in the decision model. Details of the study sample and design were not provided and a review of the literature was not conducted.

Validity of estimate of measure of benefit

No summary benefit measure was used in the analysis because a cost-minimisation analysis was conducted.

Validity of estimate of costs

The perspective adopted in the study was explicitly reported. It seems that all the relevant categories of costs have been included in the analysis. The authors focused their interest on the cost side of the analysis and the details of the methodology of the economic study were clearly reported. The sources of the costs were reported for each category, whereas the unit costs were provided for a only few items. The resource use data came mainly from a published study. The price year was reported, thus simplifying reflation exercises in other settings. The costs were treated deterministically in the base-case, but extensive sensitivity analyses were conducted. The authors acknowledged that selecting the payer's perspective limited the validity of the analysis since some categories of costs (e.g. indirect or non-medical costs) were not considered.

Other issues

The authors did not compare their findings with those from other studies. They also did not explicitly address the issue of the generalisability of the study results to other settings, although sensitivity analyses were conducted, thus enhancing the external validity of the analysis. The authors discussed some specific assumptions that were made in the analysis. First, the choice of giving no inherent value to the avoidance of platelet transfusion, although this assumption may be questionable in a setting where platelets were considered as a scarce resource. Second, the two treatments were considered similar in terms of the effectiveness profile. The use of a lower threshold for transfusion (<10,000 platelets/microL) was also mentioned.

Implications of the study

The study results suggest that "the use of rhIL-11 probably should be confined to patients for whom platelet transfusion or chemotherapy dose reductions would be inappropriate". The authors noted that a large randomised trial should be conducted to show the effectiveness of rhIL-11.

Source of funding

None stated.

Bibliographic details

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Antineoplastic Agents /adverse effects; Costs and Cost Analysis; Humans; Interleukin-11 /adverse effects /therapeutic use; Models, Theoretical; Platelet Transfusion /economics; Recombinant Proteins /adverse effects /therapeutic use; Thrombocytopenia /chemically induced /prevention & control

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