What are cancer patients willing to pay for prophylactic epoetin alfa? A cost-benefit 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.

Health technology
Prophylactic epoetin alfa as a potential alternative to reduce the blood transfusion requirements (caused by anaemia: blood haemoglobin less than 12g/dL) of patients receiving cancer chemotherapy.

Type of intervention
Secondary prevention.

Economic study type
Cost-benefit analysis.

Study population
The study population was based on cancer patients (half with solid tumour that would be typically treated with a cisplatin-containing regimen, and half whose neoplasm would typically be treated with non-cisplatin) and subjects selected from the general (Canadian) population.

Setting
Hospital. The economic study was conducted in Toronto (Canada). Subjects from the general population were interviewed by telephone, while cancer patients were interviewed face-to-face in hospital.

Dates to which data relate
Effectiveness data were derived from a study conducted in 1991. Dates for resource data and prices were not reported.

Source of effectiveness data
Effectiveness data were derived from a single study. The absolute risk reduction (ARR) in red blood transfusions due to epoetin alfa (both for cisplatin and non-cisplatin based chemotherapy) was based on a study by Abels et al. (randomised, double blind placebo controlled trial). The willingness to pay (WTP) of cancer patients and general population for epoetin alfa agent was calculated by face-to-face interviews, questionnaires and telephone interviews.

Link between effectiveness and cost data
Part of the costing (epoetin alfa treatment costs) was estimated on the basis of the typical resources required for the typical cancer patient, while transfusion costs were calculated via a retrospective chart review of 100 randomly selected cancer patients.

Study sample
The study sample for the WTP calculation was based on 100 cancer patients (50 with neoplasm typically treated with cisplatin and 50 with solid tumour not typically treated with cisplatin) and 50 subjects of the general population. Cancer
patients were selected in order to be consistent with the incidence of cancer malignancies in the Canadian population. Subjects from the general population were selected by random telephone digit dialling. The absolute risk reduction (ARR) in red blood transfusions was based on a single source, where cancer patients where randomly included in cisplatin, non-cisplatin and placebo groups. No power calculations were reported. Among the cancer patients the overall questionnaire rate was 94% (100 out of 106). Among the general public the response rate was extremely low at 31% (50 out of 161).

**Study design**
The benefit portion of the study was measured by the WTP method. Cancer patients were selected by block randomisation (in order to be consistent with cancer incidence in Canada) while subjects of the general population were randomly selected.

**Analysis of effectiveness**
Effectiveness of epoetin alfa was calculated in monetary terms on the basis of patients and general public who completed the questionnaires and the interviews. Evident socioeconomic differences were found among cisplatin patients, non-cisplatin patients and the general public (in particular for the unemployment rate: 76% for cisplatin patients, 52% for non-cisplatin patients and 36% for the general public).

**Effectiveness results**
For the WTP results see the estimated benefit field reported in the economic analysis.

**Measure of benefits used in the economic analysis**
The monetary benefits of epoetin alfa where calculated using the WTP method. Cancer patients were interviewed face-to-face, while subjects of the general population received a copy of a WTP questionnaire and were interviewed by telephone. To introduce the WTP scenario responders were informed about the probability of requiring a blood transfusion during the second and third month of chemotherapy with and without epoetin alfa, and about dosage, method of administration and toxicity of the new drug. To make the scenario realistic the WTP was presented to subjects of the general population in the form of a hypothetical taxation question. In order to avoid starting point bias the payment card method was used.

**Direct costs**
A Cost-benefit analysis was conducted from the societal viewpoint. The analytic period was the first 3 months of cisplatin and non-cisplatin chemotherapy. The cost analysis included: medical resources required for 12 weeks of epoetin alfa (standard dose for typical cancer patient), patients' education costs, laboratory monitoring, and transfusions costs. Potential savings due to a reduction of blood transfusion were based on the Abels et al study. The transfusion cost per patient was estimated by combining published Canadian unit data for general medicine patients with resource utilisation specific to cancer patients. Unit costs and cost per patient were reported separately. No discount rate was applied (due to a 3-month follow-up period) and no dates were reported.

**Statistical analysis of costs**
No statistical analysis of costs was reported. Multivariate analyses were performed in order to evaluate the association between maximum WTP and respondent characteristics. Differences in maximum WTP between the two patient groups (cisplatin and non-cisplatin) were estimated by the non-parametric Mann-Whitney U test, while intrasubject differences between public volunteers were assessed by the Wilcoxon signed rank test.

**Indirect Costs**
Only indirect patient transfusion costs (e.g. travel time) were reported.
Currency
US dollars ($).

Sensitivity analysis
A one way sensitivity analysis was performed on blood transfusion costs and on discount rate (to estimate the maximum WTP from subjects of general population, their annual tax payment for epoetin alfa was multiplied by the respondent’s life expectancy and discounted at a rate of 5%) in order to test the robustness of the study.

Estimated benefits used in the economic analysis
For 3 months of epoetin alfa, cisplatin patients were willing to pay a mean of $587, while for non-cisplatin patients the figure was $613. Public volunteers were willing to pay $800 for the use of epoetin alfa in cisplatin and $680 for the use of epoetin alfa in non-cisplatin-containing protocols.

Cost results
The costs for 3 months of epoetin alfa for a typical cancer patient were estimated at $3,700.

The cost of blood transfusion per patient during the second and third month of treatment was $583.

The transfusion costs per patient were multiplied by the ARR in order to calculate savings related to epoetin use.

The final health care cost of epoetin alfa for cisplatin patient was then estimated at $3,530 (95% CI: $3,470 - $3,590), and $43,653 (95% CI: $3,636 - $3,669) for non-cisplatin patients.

Synthesis of costs and benefits
The maximum WTP was subtracted from the overall cost of epoetin alfa therapy in order to estimate the net benefit of the new drug.

The result was a net cost of $2,943 (95% CI: $2,655 - $3,230) for cisplatin patients and of $3,039 (95% CI: $2,750 - $3,328) for non-cisplatin patients.

Only 4% of cancer patients were willing to pay the actual amount required to cover the costs of the drug.

Among the general public the result was a societal cost of $2,731 (95% CI: $2,252 - $3,209) for cisplatin patients and $2,973 (95% CI: $2,799 - $3,426) for non-cisplatin patients.

6% of the general public were willing to cover the cost of epoetin alfa.

The results were insensitive to changes in the parameters.

Authors' conclusions
The use of epoetin alfa for the prevention of anaemia is very resource-intensive for a modest clinical benefit as perceived by cancer patients and by the general population.

CRD COMMENTARY - Selection of comparators
The choice of comparator is appropriate since blood transfusion is the usual practice for cancer patients suffering from anaemia. Effectiveness data were derived from a single study. Other studies were available but not used to derive ARR. The authors gave no explanation for the choice of the single study.

Validity of estimate of measure of benefit
The small sample size and the socioeconomic differences between cisplatin, non-cisplatin cancer patients and general population subjects give a possible weakness in the estimation of benefits. However, the strong evidence against the cost/benefit of epoetin alfa and the results of the sensitivity analysis appear to confirm the robustness of the study. Differences in income and age, possible confounders, were addressed in the multivariate analysis and were not found to be statistically significant.

**Validity of estimate of costs**
The epoetin alfa costs were based on the typical cancer patient, while transfusion cost savings were calculated by multiplying the ARRs, obtained from the RCT used as source of effectiveness, by the average transfusion cost per patient, obtained from a retrospective chart review of 100 randomly selected cancer patients. A little more information regarding the comparability of the two sources would have been useful in estimating the validity of the analysis.

**Other issues**
The extremely low response rate among the general public may raise some issues around selection bias. Anaemia is only one of the complications of patients undergoing treatment for cancer. An interesting study would be a cost-utility analysis to take into account the quality of life. The study was undertaken in Canada. Given the differences in health care systems between the USA and Canada (both in terms of costs and eligibility) the issue of study generalisability to the USA oncology setting should be addressed.

**Implications of the study**
The results of the study suggest that compared to blood transfusion the use of prophylactic epoetin alfa is less cost-effective.

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**Other publications of related interest**


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