Neutropenic complications in advanced-stage non-Hodgkins lymphoma: implications for the use of prophylactic recombinant human granulocyte-colony stimulating factor (G-CSF)

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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 treatment with recombinant human granulocyte-colony stimulating factor (G-CSF) following the occurrence of neutropenic complications in advanced stage non-Hodgkin's lymphoma.

Type of intervention
Treatment; primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Male and female patients with advanced-stage non-Hodgkin's lymphoma, aged between 19 and 69 years (median: 52 years).

Setting
Hospital. The economic study was carried out at the Tom Baker Cancer Centre, Calgary, Canada.

Dates to which data relate
Effectiveness data were extracted for patients who entered the hospital between January 1992 and December 1993. Resources used were calculated from the first day of hospitalisation for neutropenic complications. Price data related to the period 1992 to 1993. No price year was stated.

Source of effectiveness data
Effectiveness data were taken from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
Only patients between 18 and 70 years of age with biopsy-proven stage III, IV or IAE non-Hodgkin's lymphoma entered the study. Fourteen patients were excluded. In the end, 42 patients were included in the study sample. Power calculations were not used to determine the sample size.

Study design
Retrospective case series, carried out at one site. No follow-up of patients was undertaken.

**Analysis of effectiveness**
The basis for the analysis was the whole study sample. The primary study endpoints were the incidence of febrile neutropenic events, documented infections and chemotherapy dose delays or dose reductions.

**Effectiveness results**
Of the 42 patients, 8 (19%) experienced febrile neutropenic events and 18 (43%) required chemotherapy dose modifications (delays or reductions or both) because of neutropenia. 7 patients (17%) had clinically documented infections while neutropenic.

**Clinical conclusions**
Febrile neutropenia and infection causes significant morbidity and mortality in patients receiving combination chemotherapy for the treatment of advanced-stage non-Hodgkin’s lymphoma. Secondary prophylactic G-CSF has been proven to decrease the incidence of febrile neutropenia and infection in these patients.

**Modelling**
Modelling was used to assess the economic implications (costs and life years saved) of the use of secondary prophylactic G-CSF. Specific details of the type of model used were not given.

**Measure of benefits used in the economic analysis**
The measure of benefits used was Life Years Saved. Survival rates and life expectancy were extrapolated from another study and were applied to the study sample to calculate life years saved.

**Direct costs**
Costs of hospitalisation, antibiotics, relevant investigations and the use of secondary prophylactic G-CSF were incorporated into the analysis. Both quantities and costs were reported for hospitalisation and the use of antibiotics. The administration of G-CSF may affect the dose intensity of chemotherapy given to patients. This trade-off was taken into account in the cost calculations. The quantity/cost boundary was that of the hospital. The price year was not stated. The principal source of cost data was the Foothills hospital, Calgary, Canada.

**Statistical analysis of costs**
Not stated.

**Indirect Costs**
Not assessed.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was carried out.

**Estimated benefits used in the economic analysis**
The use of prophylactic G-CSF resulted in a 29-year increase in life expectancy for the high-risk patients. For patients who underwent the cyclophosphamide, doxorubicin, vincristine and prednisone (CHOP) regimen, a cumulative survival of 58.6 years was expected.

Cost results
The cost of treating febrile neutropenic episodes and documented infections was $21,000 for the high-risk patients and $8,500 for the CHOP patients. The cost of secondary prophylactic G-CSF was determined to be $111,000 for the high-risk patients and $46,500 for the CHOP patients. The increased cost due to the use of G-CSF equalled $93,300 for the high-risk patients. For the CHOP patients the incremental cost due to G-CSF amounted to $275,420.

Synthesis of costs and benefits
Estimated costs and benefits were combined in CE ratios: cost/life year saved. An incremental analysis was performed. For the high-risk patients an incremental cost per life year saved associated with the use of G-CSF of $3,300 was found. The incremental cost per life year saved increased to $4,700 for the CHOP patients.

Authors' conclusions
Febrile neutropenia and infection cause significant morbidity and mortality in patients receiving combination chemotherapy for the treatment of advanced-stage non-Hodgkin's lymphoma. Secondary prophylactic G-CSF has been proven to decrease the incidence of febrile neutropenia and infection in these patients. The incremental cost per life year saved of $3,300 with G-CSF therapy is relatively low compared with other medical interventions.

CRD COMMENTARY - Selection of comparators
The reason for the choice of comparator is clear.

Validity of estimate of measure of benefit
Life years saved were used instead of the more informative Quality Adjusted Life Years. Moreover, life years saved were calculated on the basis of survival rates and life expectancies derived from another study. Effectiveness data on the patients in the study could not be obtained because many patients were lost to follow-up. Assumptions had to be made when data were not available in the literature.

Validity of estimate of costs
Adequate details of the cost estimation were provided and all relevant direct costs were included.

Other issues
The accuracy of the theoretical cost per life year saved estimate is difficult to determine because of limitations in the economic model used. The strength of the study is impaired by the small sample size, the retrospective study design and the absence of follow-up of patients.

Implications of the study
The incremental cost per life year saved with G-CSF therapy is relatively low compared with other medical interventions. The use of G-CSF may allow for higher doses of chemotherapy to be administered. Their combined effect on cure and survival rates should be investigated.

Source of funding
None stated.
Bibliographic details

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Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Antineoplastic Combined Chemotherapy Protocols /adverse effects /therapeutic use; Cost-Benefit Analysis; Female; Granulocyte Colony-Stimulating Factor /economics /therapeutic use; Humans; Lymphoma, Non-Hodgkin /drug therapy; Male; Middle Aged; Neutropenia /chemically induced /prevention & control; Recombinant Proteins; Retrospective Studies

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