Economic analysis of prophylactic pegfilgrastim in adult cancer 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.

CRD summary
The study assessed the cost-effectiveness of the granulocyte colony-stimulating factor (G-CSF) pegfilgrastim, a prophylactic therapy for side-effects of the first cycle of chemotherapy in cancer patients, in comparison with filgrastim therapy or no G-CSF. The study demonstrated that pegfilgrastim was both more effective and cost-saving from the perspective of US society. The methodology and reporting of the analysis was good, especially on the economic side. The authors' conclusions are likely to be robust, as shown in the extensive sensitivity analysis.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective of the study was to assess the cost-effectiveness of the granulocyte colony-stimulating factor (G-CSF) pegfilgrastim, a prophylactic therapy for side-effects (i.e. febrile neutropenia) of the first cycle of chemotherapy, in comparison with filgrastim therapy or no G-CSF. The patient population included hospitalised individuals aged 18 to 65 years with a solid tumour cancer.

Interventions
The three strategies studied were: no G-CSF, filgrastim administered daily for 7 to 12 days after the first cycle of chemotherapy, and the pegylated form of G-CSF (pegfilgrastim) administered once per cycle.

Location/setting
USA/hospital.

Methods
Analytical approach:
This economic evaluation was based on the development of an analytic decision model, the structure of which was based on common clinical practice. The time horizon of the analysis was 21 days, this corresponding to the duration of the first cycle of chemotherapy. The authors stated that a societal perspective was adopted.

Effectiveness data:
The probability estimates used to populate the decision model were based on published evidence. Details of a review of the literature were not given. The effect of pegfilgrastim treatment was taken from a double-blind, randomised controlled trial (RCT), which represented the only RCT available for this intervention. The effect of filgrastim therapy was obtained from a meta-analysis of 17 RCTs. There was no information on other sources of data, but much of the evidence was taken from the two sources already mentioned.

Monetary benefit and utility valuations:
The utility values for specific conditions were based on data from a study in which 180 nurses served as proxies in evaluating cancer patients’ preferences using the standard gamble approach.

Measure of benefit:
The summary benefit measure was quality-adjusted survival. This was expressed as the number of quality-adjusted life-days (QALDs).
Cost data:
The cost items included in the analysis were antibiotics per injection, hospitalisation for surviving or dying patients, filgrastim, pegfilgrastim, physician time, time of other medical staff, travel per outpatient visit or hospitalisation, and the patient’s average hourly wage. Resource use and direct medical costs for hospitalisation were derived from the University Health System Consortium database (incorporating claims data reported by 115 US academic medical centres) and other published studies. Cost-to-charge ratios were applied when relevant. The indirect costs associated with productivity losses were based on data from the Bureau of Labor. The travel costs came from the US Department of the Treasury. Other costs were from published sources such as Medicare databases or published studies. Drug costs reflected average wholesale prices discounted by 15%. The unit costs and the quantities of resources used were presented separately. The costs were in US dollars ($). The price year was 2005.

Analysis of uncertainty:
A one-way sensitivity analysis was undertaken for each model input. The sources of ranges of values were not explicitly stated. A more comprehensive sensitivity analysis was carried out using a second-order Monte Carlo simulation (probabilistic sensitivity analysis), which generated 95% confidence intervals for cost-utility ratios. Details of the probabilistic distributions assigned to model inputs were given.

Results
Under base-case assumptions, the expected costs and QALDs were $4,185 and 12.362 for no G-CSF, $3,057 and 12.967 for pegfilgrastim, and $5,262 and 12.698 for filgrastim. Thus, pegfilgrastim was the dominant strategy, as it was both more effective and less expensive than the other options.

The sensitivity analysis showed that base-case results were, in general, robust to variations in the model inputs. Pegfilgrastim remained the preferred strategy unless very substantial variations in the model input were assumed. The probabilistic sensitivity analysis showed that pegfilgrastim was more effective than no G-CSF in 100% of simulations, and less costly in 80% of cases.

Authors' conclusions
The authors concluded that the prophylactic administration of pegfilgrastim in cancer patients receiving chemotherapy was not only more effective, but also cost-saving, in comparison with other available options from the perspective of US society. The authors stated that further studies taking into account a longer time horizon and the potential long-term effects of pegfilgrastim should be undertaken.

CRD commentary
Interventions:
The selection of the comparators was appropriate in that they reflected the possible strategies for patients undergoing chemotherapy. Specifically, current guidelines of the American Society of Clinical Oncology recommend primary prophylactic G-CSF administration for chemotherapy regimens. Recent studies have demonstrated the superior clinical profile of pegfilgrastim over filgrastim.

Effectiveness/benefits:
Little information was provided on the approach used to identify primary sources of data. However, the effect of treatment was derived from an RCT for pegfilgrastim and from a meta-analysis of RCTs for filgrastim. Both studies represent an appropriate and valid source for clinical estimates. The authors noted that a drawback of the analysis was the heterogeneity in terms of chemotherapy regimens among the sources used, thus potential differences in baseline risk between patient populations cannot be ruled out. The authors attempted to address this issue by extensive sensitivity analyses. The use of QALDs appears appropriate for the disease analysed.

Costs:
The categories of costs included in the analysis were consistent with the perspective adopted in the study. Extensive information on the analysis was given: specifically, a breakdown of the cost items and details of the unit costs and quantities of resources used. These enhance the possibility of replicating the economic analysis in other settings. The sources of data were reported for all items, most of which were clearly relevant to the US context. Details of the cost
calculations were given. The price year was reported. Statistical analyses of the costs were performed in the sensitivity analysis. Treatment patterns considered in the analysis reflected common practice in the authors’ setting.

Analysis and results:
The synthesis of the costs and benefits was appropriate and the results of the analysis were presented clearly. The issue of uncertainty was appropriately addressed and discussed. A clear description of the decision model was given.

Concluding remarks:
The quality of the methodology was good, both in the clinical and in the economic analysis. The authors’ conclusions appear robust, as shown in the sensitivity analysis.

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Bibliographic details

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Algorithms; Ambulatory Care /economics; Antineoplastic Combined Chemotherapy Protocols /adverse effects; Colony-Stimulating Factors, Recombinant /economics /therapeutic use; Cost-Benefit Analysis; Filgrastim /economics /therapeutic use; Hospitalization /economics; Humans; Meta-Analysis as Topic; Middle Aged; Models, Economic; Neutropenia /complications /drug therapy; Quality-Adjusted Life Years; Randomized Controlled Trials as Topic

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