Cost-effectiveness in Canada of intravenous proton pump inhibitors for all patients presenting with acute upper gastrointestinal bleeding


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
An approach in which an intravenous (i.v.) proton-pump inhibitor (PPI), such as pantoprazole, was administered before endoscopy treatment was examined in patients with upper gastrointestinal (GI) bleeding.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of patients presenting to the emergency department with upper GI bleeding.

Setting
The setting appears to have been an emergency department. The economic study was carried out in Canada.

Dates to which data relate
The effectiveness data came from a study that was submitted in 2002, while data on resource use were gathered from 1999 to 2000. The price year was 2001.

Source of effectiveness data
The effectiveness evidence was derived from a study which, at the time this abstract was written, had been submitted but not yet published. The authors also made some assumptions.

Modelling
A decision tree model was constructed to evaluate the costs and benefits (bleeding recurrences avoided) associated with the two strategies considered in the analysis. The structure of the model was depicted graphically. The time horizon was 60 days.

Outcomes assessed in the review
The outcomes assessed from the published study were the probability values used as inputs in the decision model. The parameters used to populate the model were:

the probability of success (nonrecurrence of bleeding) and failure of the PPI treatment,
the probability of success and failure of standard endoscopic therapy,
the probability of re-bleeding and serious re-bleeding,
the probability of success or death after surgery in the case of serious re-bleeding, and
the probability of success and failure of a repeated endoscopic treatment (in the case of non serious re-bleeding).

Study designs and other criteria for inclusion in the review
Not stated.

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 was derived from only one primary study.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
The probability values that were used in the decision model were not tabulated, but were depicted in the tree structure.

The probability of success of the PPI treatment was 0.93 (failure 0.07), while the probability of success of the standard endoscopic treatment was 0.73 (failure 0.27).

In the case of failure, the probability of serious re-bleed was 0.25 for PPI treatment and 0.15 for standard endoscopic treatment. The probabilities of non serious re-bleed were 0.75 (PPI treatment) and 0.85 (standard endoscopic treatment), respectively.

The probability of death after surgery, in the case of serious re-bleed was 0.12 in both arms (success 0.88). The probability of success of a second endoscopic therapy was 0.83 in the PPI arm and 0.82 in the standard endoscopic treatment arm.

Methods used to derive estimates of effectiveness
The authors made some assumptions that were used in the decision model.
Estimates of effectiveness and key assumptions

It was assumed that:

all patients underwent endoscopy on average at 24 hours of presentation;

patients that had peptic ulcer disease with active bleeding, visible vessel, or overlying clot would continue with i.v. PPI for 72 hours, while for those with upper GI bleeding due to other causes, PPI was stopped immediately after endoscopy;

successfully treated patients were dispensed an oral PPI daily for 30 days;

the administration of PPI before endoscopic therapy had the same effect as that found in a published study when it was given after endoscopic treatment.

Measure of benefits used in the economic analysis

The summary health benefit used in the economic analysis was the number of bleeding recurrences. This was derived from the decision model.

Direct costs

Discounting was not applied because the costs were incurred during a short time. The unit costs were analysed separately from the quantities of resources used. The health services included in the economic evaluation were PPIs (i.v. and oral), hospitalisations, professional fees (endoscopy, suture ligation, partial gastrectomy, vagotomy), gastroenterologist visits, surgical visits and anaesthesiologist visits. The cost/resource boundary adopted in the study was that of the third-party payer. Resource use was estimated using actual data coming from the Canadian Institute for Health Information (CIHI) and was estimated in 1999 and 2000. Experts’ opinions were also used for some items. The unit costs came from actual CIHI costs, official provincial physician fees payment schedules, and the St. Paul’s Hospital (a large teaching hospital) in Vancouver (Canada). The price year was 2001.

Statistical analysis of costs

The costs were treated deterministically in the base-case.

Indirect Costs

The indirect costs were not included.

Currency

Canadian dollars (Can$).

Sensitivity analysis

To deal with uncertainty, one-way sensitivity analyses were conducted on all model inputs (both costs and probability values). The model inputs were varied by plus or minus 20%. A probabilistic sensitivity analysis was also performed, in which the distribution of all variables used in the model were varied simultaneously over a large number of times.

Estimated benefits used in the economic analysis

It was estimated that, in a hypothetical cohort of 1,000 patients presenting with upper GI bleeding, 216 would have peptic ulcers with high-risk stigmata. The expected number of re-bleeding episodes was 16 with the study strategy and 56 with the standard approach. Thus, the option of i.v. PPI started before endoscopy plus endoscopic treatment reduced the number of bleeding recurrences by 40 cases.
Cost results
The expected costs in the cohort of 1,000 patients were Can$1,171,980 with the study strategy and Can$1,209,820 with the standard approach. Thus, the study strategy resulted in cost-savings from the perspective of the hospital.

Synthesis of costs and benefits
An incremental cost-effectiveness analysis was conducted to combine the costs and benefits of the two strategies. However, a standard cost-effectiveness ratio was not calculated because the study intervention dominated the alternative approach, being more beneficial and less costly. This conclusion was generally confirmed in the sensitivity analysis, the exception being where the baseline probability of a first re-bleed was reduced by 20%. In this case, the cost per re-bleed case averted was $105, which appears to have been reasonably low. An acceptability curve analysis showed that the probability that the study intervention led to cost-savings was 0.63. This rose to 0.95 when the willingness to pay of the health payer was Can$3,700.

Authors’ conclusions
Intravenous proton-pump inhibitor (i.v. PPI), given to all patients presenting to the emergency department with upper gastrointestinal (GI) bleeding, was a cost-effective option in comparison with the standard strategy of waiting for the endoscopic results.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. The strategy of endoscopic treatment before PPI was selected because it represented the traditional approach used to treat patients with upper GI bleeding. You should decide whether it reflects the current practice in your own setting.

Validity of estimate of measure of effectiveness
The analysis of effectiveness used data derived from a study performed by the same authors as those of the present study. However, at the time this abstract was written, the primary study had not yet been published. Thus, it was not possible to refer to it for the details. In addition, the probability values were not explicitly reported. Some assumptions were also made in the effectiveness study.

Validity of estimate of measure of benefit
The summary benefit measure was disease-specific and was obtained through the decision model. It is difficult to compare such a measure with the benefits of other interventions funded by the third-party payer.

Validity of estimate of costs
The perspective adopted in the study was explicitly stated and all the relevant categories of costs were included in the analysis. A detailed breakdown of the costs was provided and the unit costs were reported separately from the quantities of resources used. The price year was also given, thus facilitating the reproducibility of the economic analysis in other settings. Although the costs were treated deterministically in the base-case, sensitivity analyses were conducted on all cost items. The source of the unit costs was provided for each category included in the economic evaluation. The authors stated that the inclusion of the indirect costs would have been likely to increase the cost-savings associated with the study intervention.

Other issues
The authors compared their findings with those from other studies and consistent results were obtained. However, the issue of the generalisability of the study results to other settings was not explicitly addressed. The external validity was ensured by the fact that several sensitivity analyses were performed and the results were reported in detail. The study referred to patients with upper GI bleeding and this was reflected in the conclusions of the analysis. The authors noted some limitations of their study, which were widely discussed in the paper. In particular, they underlined the importance

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of assuming that PPI treatment was discontinued at 24 hours in all patients without high-risk endoscopic stigmata. If the administration of PPI were inadvertently continued (e.g. for 36 hours), the administration of i.v. PPI before endoscopic treatment would have become cost neutral rather than dominant.

**Implications of the study**
The authors suggested that, according to their findings, i.v. PPI should represent the routine treatment for all patients presenting to Canadian emergency rooms with upper GI bleeding, especially for those in whom urgent endoscopy is not possible.

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None stated.

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