Cost-effectiveness of proton-pump inhibition before endoscopy in 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.

CRD summary
The study determined the cost-effectiveness of intravenous proton-pump inhibitors (IV PPIs) before endoscopy in patients with suspected upper gastrointestinal bleeding, compared with IV PPIs administered post-endoscopy on the basis of endoscopy findings, in Canada and the USA. The authors concluded that IV PPIs given before endoscopy were quite cost-effective in the USA and in Canada, especially if, in the latter context, the duration of hospitalisation for high-risk ulcer patients increased or that of low-risk ulcer patients decreased. The quality of the study methodology was good, with good presentation of the methods and results. The analysis showed that the cost-effectiveness ratios were highly dependent on assumptions about resource consumption.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective of the study was to determine the cost-effectiveness of using intravenous (IV) proton-pump inhibitors (PPIs) before endoscopy in patients with suspected upper gastrointestinal bleeding (UGIB), compared with IV PPIs administered on the basis of endoscopic findings, in Canada and the USA.

Interventions
The study examined IV PPI before endoscopy in patients with suspected UGIB. The IV PPI regimen consisted of pantoprazole 80-mg bolus followed by 8 mg hourly (high-dose regimen), administered 24 hours before endoscopy. This strategy was compared with the same dosage of PPI administered after endoscopy. For both options, the infusion was continued for 72 hours after gastroscopy only in patients receiving endoscopic haemostasis for a lesion at high-risk of re-bleeding, and was followed by an oral dose of 40 mg/day pantoprazole for 30 days.

Location/setting
Canada/USA. Secondary care.

Methods
Analytical approach:
This economic evaluation was based on a decision tree model, which was developed to assess the costs and benefits of the two approaches on the basis of recent clinical evidence. The time horizon of the analysis was 30 days post-endoscopy. The authors stated that the perspective of the third-party payer was adopted.

Effectiveness data:
The clinical data were derived from a systematic review of the literature. The main search criteria (i.e. databases, keywords, etc.) were reported. Key data on the probabilities of re-bleeding for the two strategies compared were derived from a Cochrane review, in which a meta-analysis was presumably used to combine the primary estimates from five studies. Estimates from a recent clinical trial were also used for an alternative analysis. Other data were taken from published studies, details of which were not explicitly provided.

Monetary benefit and utility valuations:
None.
Measure of benefit:
The summary benefit measure was the proportion of patients without re-bleeding at 30 days. This was estimated using the decision model.

Cost data:
The two main categories of costs considered were hospital costs (length of stay) and additional pharmacologic costs. A breakdown of the cost items for hospital services was not given as the costs were determined on a per-diem basis. US charges were based on the Nationwide Inpatient Sample 2002 using diagnosis-related groups. Charges were converted into costs using a predefined cost-to-charge ratio. Length of stay was derived from a previous analysis by the current authors. Canadian estimates were based on the Canadian Institute for Health, which is a national database. Length of stay for the Canadian setting was derived from a recent Canadian randomised clinical trial and a national registry. The costs were in Canadian dollars (CAD) and US dollars ($). The price year was 2005.

Analysis of uncertainty:
A deterministic sensitivity analysis was carried out to assess the robustness of the cost-effectiveness results to variations in model inputs. Alternative ranges of values for probability estimates were based on the 95% confidence intervals found in published sources, while the costs were varied by +/- 50%. Threshold analyses were performed to identify those values that changed the final cost-effectiveness decision. An alternative analysis was conducted using probability estimates from a recent clinical trial instead of those obtained from the Cochrane review.

Results
Incremental cost-effectiveness ratios (ICERs) were calculated as the incremental cost per averted re-bleeding episode with respect to the less effective strategy.

In Canada, the total cost per patient was CAD 5,451 with post-endoscopy IV PPI and CAD 5,502 with pre-endoscopy IV PPI. The corresponding values in the USA were $4,463 and $4,580, respectively.

The probability of no re-bleeding was 0.9047 with post-endoscopy IV PPI and 0.9072 with pre-endoscopy IV PPI. Thus, the ICER was CAD 19,832 for Canada and $45,673 for the USA.

In an alternative scenario the conclusions remained the same for both countries, with ICERs of CAD 10,277 for Canada and $29,114 for the USA.

The sensitivity analysis corroborated the base-case findings, especially for the US setting. In Canada, the threshold analysis showed that pre-endoscopy IV PPI became dominant (more effective and less expensive) when the uncomplicated stay for high-risk patients increased to more than 6 days, or that of low-risk patients fell below 3 days.

Authors’ conclusions
The authors concluded that IV PPIs given before endoscopy were quite cost-effective in the USA and Canada, especially if, in the latter context, the duration of hospitalisation increased for high-risk ulcer patients or decreased for low-risk ulcer patients.

CRD commentary
Interventions:
The selection of the comparators was appropriate given their relevance in the two settings considered in the analysis. Furthermore, the choice of pantoprazole from among the available PPIs was based on the fact that it represented the most widely used IV PPI in the two countries. These comparators are also likely to be valid in other settings.

Effectiveness/benefits:
The clinical data were derived from a systematic review of the literature, the main details of which were described. At the end of the search process, the entire clinical evidence relied on a single source, a Cochrane review of five studies; this represents a robust source of data. An alternative analysis was performed using a more recent source of data in order to determine the robustness of cost-effectiveness results to variations in clinical evidence. The derivation of the benefit measure was based on these clinical data. The authors noted that data on clinical effectiveness were taken from...
studies assessing omeprazole, while pantoprazole was used as the PPI in their economic analysis. Thus, it was implicitly assumed that the two PPIs had equal effectiveness. Re-bleeding rate represents a widely used measure for strategies using PPIs. The authors stated that the use of quality-of-life estimates in short and acute episode of illness might be unreliable, thus they elected not to use them. However, it is considered that an assessment of the patients’ quality of life under the two strategies would have been interesting.

Costs:
The analysis of the costs was consistent with the authors' stated perspective. The costs were presented as macro-categories, which reflect the accounting system in the two countries. The sources of the data, which were reported, reflected relevant national databases. A cost-to-charge ratio was applied to US data to reflect the true costs of the services. Thus, the costs and the quantities were not presented separately. The price year was reported, which will assist with reflation exercises in other settings.

Analysis and results:
The costs and benefits were synthesised in average and incremental ratios, which were reported clearly. The structure of the decision model and the key pathways were described. The issue of uncertainty was addressed in the sensitivity analysis, in which all model inputs were varied across a plausible range. The authors underlined the variability in cost estimates between different contexts, thus these results should be considered as specific to the USA and Canada.

Concluding remarks:
Overall, the quality of the study methodology was satisfactory, with good reporting and presentation of the results. The selection of primary sources of clinical and economic data was justified. The analysis showed that, especially in the Canadian setting, the ICERs depended on some assumptions about resource consumption such as length of stay.

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Bibliographic details

Other publications of related interest


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