Erythromycin prior to endoscopy for acute upper gastrointestinal haemorrhage: a cost-effectiveness 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.

CRD summary
The study determined the cost-effectiveness of erythromycin used before oesophago-gastroduodenoscopy in patients with upper gastrointestinal haemorrhage. Erythromycin was compared with no treatment, the perspective being that of the US health care payer. The study demonstrated the superior economic and clinical profile of erythromycin infusion due to the fewer second-look endoscopies required. The quality of the study was good in terms of the reporting of both methods and results.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective of the study was to determine the cost-effectiveness of erythromycin (ERY) used before oesophago-gastroduodenoscopy (EGD), compared with no treatment, in patients with upper gastrointestinal haemorrhage (UGIH).

Interventions
The two strategies under examination were ERY infusion before endoscopy for UGIH versus endoscopy without ERY infusion.

Location/setting
USA/hospital.

Methods
Analytical approach:
A decision tree analysis was developed in order to determine the costs and benefits of the two strategies under examination. The time horizon of the analysis was 1 year. The authors stated that the perspective of the health care payer was adopted.

Effectiveness data:
A review of PubMed was undertaken to identify relevant randomised clinical trials (RCTs) on ERY, which were then used to populate the decision model. Pooled estimates were calculated. Details of the search and inclusion criteria were provided. A systematic review of the literature was also conducted in order to obtain epidemiological data on patients with UGIH. If published evidence was not available, the Healthcare Utilization Project National Inpatient Sample (NIS) database of discharge data from 1,004 hospitals was used. The key clinical end point was the rate of need for second-look endoscopy.

Monetary benefit and utility valuations:
Utility estimates were based on a published model that used the health-related quality of life (HRQOL) estimates in upper gastrointestinal bleeding. The utility weights were derived from time trade-off interviews with patients with chronic dyspepsia rather than patients with UGIH.

Measure of benefit:
The summary benefit measure used was the quality-adjusted life-years (QALYs). These were calculated using the decision model.
Cost data:
The categories of costs included in the analysis were treatment of UGIH, ERY, EGD, surgery for bowel perforation or bleeding, treatment of complicated peptic ulcer, angiography and embolisation. The costs were estimated using the Medicare fee schedule, thus they were presented as macro-categories. Length of hospital stay was obtained from the NIS database. The cost of ERY came from the authors’ hospital pharmacy using wholesale prices, and from a published time and motion study. The costs were inflated to 2006 values, which represented the price year. Discounting was not required given the short timeframe of the analysis. The costs were in US dollars ($).

Analysis of uncertainty:
A deterministic sensitivity analysis, which generated a tornado analysis on all model inputs, was undertaken. A univariate sensitivity analysis was performed. A first-order Monte Carlo simulation was also carried out and the results presented for several threshold values for a QALY.

Results
Compared with placebo (no infusion), the use of an ERY infusion prior to EGD led to a cost-saving of $486 and a gain in QALYs of 0.0007. Thus, ERY was a dominant strategy in the base-case.

The univariate sensitivity analysis showed that the base-case results were sensitive to variations in the rate of repeat endoscopy and the charges for peptic ulcer.

The probabilistic sensitivity analysis suggested that the ERY strategy was the dominant strategy (i.e. more effective and less expensive) in 63.7% of cases. It was cost-effective in more than 80% of simulations, independently from the threshold used as willingness-to-pay for a QALY ($0, $50,000, $100,000).

Authors' conclusions
The authors concluded that the study supports the use of ERY prior to ECG for UGIH from the perspective of the payer in the USA. The economic and clinical advantage of ERY infusion arose from the fewer second-look endoscopies required in comparison with no infusion.

CRD commentary
Interventions:
The choice of no infusion strategy was appropriate as it represented the relevant comparator in the authors’ setting.

Effectiveness/benefits:
The use of a systematic review of the literature ensured the identification of all relevant sources of data. The authors provided details of the study design, search criteria and pooling approach. The selection of RCTs for treatment effect ensures high internal validity of the primary study. Furthermore, the exclusion of some studies from the review was justified. The use of QALYs was appropriate as they can be compared with the benefits of other health care interventions and are a validated benefit measure. However, the authors pointed out that the utility values were derived from patients with dyspepsia, which may not be representative of those with the disease under consideration in this study.

Costs:
The analysis of the costs appears to have been consistent with the perspective adopted in the study. The costs were not broken down into individual items because of the accounting system used to derive them. The authors stated that the analysis was intentionally biased against the ERY strategy. Other details such as the price year and inflation were reported. The issue of variability in cost estimates was investigated in the sensitivity analysis. The authors noted that a cost-to-charge ratio was not applied, owing to the variability of this ratio in different settings, and this may represent a drawback of the analysis.

Analysis and results:
A synthesis of the costs and benefits was not required given the dominance of ERY infusion. The sensitivity analysis was appropriately performed on all model inputs. Thus, the results of the analysis appear robust. However, the use of a second-order Monte Carlo simulation, giving stochastic distributions to model parameters, would have been a more
appropriate probabilistic approach. The results of both the base-case analysis and sensitivity analysis were extensively reported. Many details of the decision model were given. The authors noted some limitations, which were mitigated by including conservative estimates that biased the analysis against the ERY branch of the model.

Concluding remarks:
The study methodology appears valid on both the clinical and economic sides of the analysis. The results of the study were extensively reported. The authors’ conclusions are appropriate and consistent with the objective of the study.

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