A second-order simulation model of the cost-effectiveness of managing dyspepsia in the United States


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 objective of the study was to determine the cost-effectiveness of follow-on strategies of dyspepsia management. The authors concluded that acid suppression alone was more cost-effective than either endoscopy or Helicobacter pylori test-and-treat in younger dyspepsia patients with a low prevalence of infection. Overall, the quality of the methodology used in this study was good, with both the methods and results being generally well reported. The authors’ conclusions appear appropriate given the scope of the study.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective of the study was to determine the cost-effectiveness of follow-on strategies for dyspepsia management and to test the assumptions made in the 2005 American Gastroenterological Association (AGA) medical position on the evaluation of dyspepsia.

Interventions
The study compared six different management strategies:

- baseline, in which all patients received antacid alone;
- treatment with empirical acid suppression;
- test for Helicobacter pylori (H. pylori) and treat positives with eradication therapy;
- initial endoscopy;
- initial treatment with proton-pump inhibitor (PPI) followed by endoscopy if needed; and
- urea breath test (UBT) and treat first, followed by PPI then endoscopy if needed.

Location/setting
USA/primary care.

Methods
Analytical approach:
The authors reported that a discrete-event simulation model incorporating first- and second-order simulation was used to determine the effect of follow-on strategies. The time horizon of the study was 5 years. The authors reported that a societal perspective was adopted in the economic analysis.

Effectiveness data:
The effectiveness data were mainly derived from Cochrane meta-analyses, with full details of the sources used in the model reported in the dyspepsia guidelines being reviewed by the authors (Talley et al. 2005, see 'Other Publications of Related Interest' below for bibliographical details).
Monetary benefit and utility valuations:
The utility values were derived from published estimates for the US population and from a published study.

Measure of benefit:
The measure of benefit was the quality-adjusted life-years (QALYs) gained.

Cost data:
The study included the direct and indirect costs associated with clinical visits, PPI (1-month dose), \( \text{H}_2 \) receptor antagonist (1-month dose), antacid therapy (1-month dose), eradication therapy, serology, UBT, endoscopy, biopsy and annual costs of dyspepsia. The drug costs were derived from average retail prices for pharmaceuticals. Physician and procedure costs were obtained from the American Medical Association Procedural Code Book and Medicare fee schedules. The price year was 2005. The authors did not report whether any discounting was undertaken.

Analysis of uncertainty:
A probabilistic sensitivity analysis was undertaken to estimate the impact of parameter uncertainty on the cost-effectiveness of competing strategies. Using the results of the meta-analyses the authors generated probability distributions around each model parameter. Comparisons of cost-effectiveness between treatment strategies were made using paired cost-effectiveness acceptability curves.

Results
For 30-year-olds, the average QALYs gained ranged from 4.2004 with antacid treatment to 4.3541 when patients were managed with the PPI then scope strategy. For 60-year-olds, the QALYs gained ranged from 4.2031 with antacid treatment to 4.3942 with PPI then scope.

For 30-year-olds, the cost per patient ranged from $1,976 with antacid treatment to $4,008 with the scope (biopsy all) strategy. For 60-year-olds, the costs ranged from $2,842 with antacid treatment to $4,557 with the scope (no biopsy) strategy.

In the treatment of 30-year-olds, the following strategies were found to be dominated by other strategies (i.e. they were more costly and less effective): PPI then scope (no biopsy); scope (no biopsy); UBT-treat-PPI-scope; and scope (biopsy all). When PPI then scope was compared with PPI alone, the additional cost per QALY gained was $23,100.

For 60-year-olds, the following were found to be dominated: \( \text{H}_2 \) receptor antagonist; PPI then scope (no biopsy); scope (no biopsy); UBT-treat-PPI-scope; and scope (biopsy all). When PPI then scope was compared with UBT and treat, the additional cost per QALY gained was $37,500.

The results of the probabilistic sensitivity analysis showed that, in the treatment of 30-year-olds, there was very little certainty that either test-and-treat or endoscopy would be cost-effective compared with PPI alone, even at very high willingness-to-pay thresholds. However, for 60-year-olds, at willingness-to-pay thresholds of $50,000 per QALY, the probability that endoscopy was cost-effective compared with PPI was 80\%, but test-and-treat was preferred to endoscopy.

Authors' conclusions
The authors concluded that acid suppression alone was more cost-effective than either endoscopy or \textit{H. pylori} test-and-treat in younger dyspepsia patients with a low prevalence of infection.

CRD commentary
Interventions:
All interventions in this study had previously been evaluated in the 2005 AGA guidelines, thus it is likely that they were all relevant in the management of dyspepsia. In addition, all the interventions were well reported.

Effectiveness/benefits:
The effectiveness data were generally derived from published Cochrane meta-analyses included in the technical reviews that formed part of the guideline. An updated review was also undertaken to test the accuracy of the model.
Consequently, it is extremely likely that the best available evidence was used.

**Costs:**
The perspective was reported clearly and it appears that all the relevant costs were considered. However, there was a lack of clarity around which indirect costs were included in the analysis. The price year was adequately reported, as was the time horizon of the study. However, although costs were incurred over a 5-year period, the authors did not report if they were discounted, and if so which rate was used.

**Analysis and results:**
Overall, the analytical approach was well reported, the model structure being described in detail with a graphical depiction. The results were also presented clearly and in full, with exhaustive probabilistic sensitivity analyses being undertaken. This type of sensitivity analysis is considered to be the best way to fully capture parameter uncertainty when using decision analytic models. Overall, the level of reporting was good.

**Concluding remarks:**
Overall, the quality of the methodology used in this study was good, with both the methods and results being generally well reported. The authors’ conclusions appear appropriate given the scope of the study.

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