Endoscopy for upper GI cancer screening in the general population: a cost-utility 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 objective was to evaluate the cost-effectiveness of screening for upper gastrointestinal cancer, by performing an upper endoscopy, when screening the general population by colonoscopy. The authors concluded that the incremental-cost-effectiveness ratio was high, but it compared favourably with common screening strategies for other cancers. Limited reporting of a few of the methods means that it is not clear if the authors’ conclusions are appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
To evaluate the cost-effectiveness of screening for upper gastrointestinal cancer, by performing an upper endoscopy, when screening the general population by colonoscopy.

Interventions
Four strategies were compared: no screening and no surveillance; performing an upper endoscopy at the time of colonoscopy, for the general population; preforming upper endoscopy, then surveillance endoscopy for Barrett’s oesophagus, for the general population, according to guidelines; and the best-case scenario, with screening of the general population at 50 years, then surveillance for Barrett's oesophagus, according to guidelines, with full compliance and optimal treatment of lesions.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A state-transition Markov model was used for the ongoing risk of developing non-dysplastic Barrett's oesophagus, oesophageal squamous cell cancer, atrophic gastritis, or intestinal metaplasia, and the progression between different disease stages. At the start of the model patients were 50 years old, and the time horizon was their life expectancy. The authors stated that the perspective was that of the third-party payer.

Effectiveness data:
To obtain the effectiveness data a systematic search was performed in MEDLINE from January 1980 to January 2010. The search was limited to articles available in English. Where data were not available, the consensus of experts was used to generate a base-case estimate. The key clinical data included the annual rate of progression between disease states and the probabilities of complications.

Monetary benefit and utility valuations:
Health-state utilities were obtained for Barrett's oesophagus, endoscopic eradication therapy, cancer, after oesophagectomy, and after gastrectomy. These were from published literature.

Measure of benefit:
The primary measure of benefit was quality-adjusted life-years (QALYs). Benefits were discounted at a rate of 3% per year.

Cost data:
The costs included the direct costs for the administration of health care. This excluded non-health care costs borne by the patient and indirect costs borne by society. Diagnosis-related group data, Current Procedural Terminology codes, and the ambulatory payment classification system were used to estimate the costs based on 2009 Centers for Medicare and Medicaid Services data. The facility fee for procedure costs was from the hospital out-patient fee schedule. Medication costs were from the Pharmacy Red Book and a review of Internet retail sources. All costs were converted into 2009 values using the medical component of the consumer price index. All values were discounted at a standard annual rate of 3% per year. The currency was US $.

Analysis of uncertainty:
All the base-case probability estimates were varied over wide ranges. One-way sensitivity analysis and tornado analysis were performed on all variables to identify the most influential ones.

Results
Compared with no screening and no surveillance, the strategy of screening with no endoscopic surveillance for Barrett's oesophagus had a total cost of $933.40 per patient and produced 18.083 QALYs, resulting in an incremental cost-effectiveness ratio of $115,664 per QALY gained.

The strategy of screening and surveillance had a cost of $960.70 per patient and produced 18.084 QALYs, resulting in a ratio of $95,559 per QALY gained.

The best-case scenario had a mean cost of $957.00 and produced 18.085 QALYs per patient, resulting in a ratio of 79,882 per QALY gained.

In one-way sensitivity analyses, to generate an incremental cost-effectiveness ratio of less than $50,000 per QALY the prevalence of oesophageal adenocarcinoma had to increase by 654%, or oesophageal squamous cell cancer by 1948%, or gastric adenocarcinoma by 337%.

Authors' conclusions
The authors concluded that the incremental cost-effectiveness ratio for screening the general population for upper gastrointestinal cancer by endoscopy was high, despite reduced endoscopy costs and the combined benefits of the early detection of oesophageal adenocarcinoma, oesophageal squamous cell cancer, and gastric adenocarcinoma. But the ratio compared favourably with common screening strategies for other cancers.

CRD commentary
Interventions:
The main strategy was described, but surveillance endoscopy for Barrett's oesophagus according to guidelines was not. The guidelines recommended no screening for the general population, with discussions of screening for those at high risk, which had no clear definition.

Effectiveness/benefits:
The authors stated that a systematic review of the literature was performed. The search criteria were stated, but the selection and evidence synthesis methods were not. Some inputs were the consensus of experts, due to a lack of published evidence, and there will be some uncertainty around these estimates. Relevant outcomes were used in the analysis, including the complications due to treatment. There was no description of the methods used to derive the utilities.

Costs:
It appears that all the relevant categories of costs were included in the analysis. All values were reported in their respective tables and the sources were given. The costs appear to have been from appropriate sources. There was no explanation of whether charges needed to be adjusted to derive the costs or the costs were found.

Analysis and results:
The authors presented a simple diagram of the model and further details were available in an online appendix. Screening only was dominated by extension (less effective and less cost-effective than another option), but this was not stated by the authors. This means that a combination of two other interventions could produce greater benefits for the
same cost as the dominated intervention. The sensitivity analysis results were reasonably well reported with a tornado diagram of the results for ranges of parameter values. The authors stated that one limitation of their analysis was the omission of pre-malignant conditions for squamous cell cancer and gastric adenocarcinoma. There were no comments on the sensitivity analysis results, but the main results seemed to be robust to changes in the parameters.

Concluding remarks:
Limited reporting of a few of the methods means that it is not clear if the authors' conclusions are appropriate.

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