Cost-effectiveness of capsule endoscopy in screening for colorectal cancer

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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
This study compared the cost-effectiveness of two population screening methods for colorectal cancer, which were capsule endoscopy and colonoscopy. The authors concluded that the cost-effectiveness of capsule endoscopy was highly dependent on the respective uptake rates in the general population. The authors did not demonstrate the use of the best available evidence. However, the analysis was transparent and the conclusions appear to be appropriate.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study evaluated the cost-effectiveness of two population screening strategies using wireless capsule endoscopy or colonoscopy for colorectal cancer (CRC).

Interventions
The two screening strategies were wireless capsule endoscopy (Pillcam Colon, Given Imaging Ltd, Yoqneam, Israel) and colonoscopy. In both strategies patients were assumed to be screened every 10 years from the age of 50 years until the age of 80 years, and both strategies were compared with no screening.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A Markov model was constructed to extrapolate clinical outcomes and compare the cost-effectiveness of the screening strategies. The health states were clearly reported. The time horizon of the model was the patient's lifetime. The authors reported that a societal perspective was adopted.

Effectiveness data:
The effectiveness data were derived from the published literature. The estimates for the base-case analysis were selected in consultation with a principal investigator and an expert panel. The main clinical parameters included the transition probabilities for the different health states, the sensitivity and specificity of the two screening strategies for different sizes of polyps and CRC, and the screening-related complication rates.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The authors used life-years saved (LYS) due to screening. Future LYS were appropriately discounted at an annual rate of 3%.

Cost data:
The cost categories included the costs of colonoscopy with and without polypectomy, capsule endoscopy, treating screening complications and different forms of CRC, and the productivity losses due to screening (including escort time). The cost of capsule endoscopy was taken from literature estimates of capsule endoscopy of the bowel. Most other cost data were taken from Medicare reimbursement figures. The costs were reported for the price year 2007 and
were appropriately discounted at an annual rate of 3%. All costs were converted to the price year 2007 using the medical component of the consumer price index.

Analysis of uncertainty:
Uncertainty was investigated using one- and two-way sensitivity analyses on all model parameters. The ranges used were reported. However, only limited results were given.

Results
Capsule endoscopy with a 6mm threshold for postcapsule colonoscopy referral resulted in 8,927 discounted LYS, without a 6mm threshold resulted in 8,255 LYS, and colonoscopy resulted in 10,669 LYS.

Capsule endoscopy with a 6mm threshold for postcapsule colonoscopy referral resulted in costs of $465 million, without a 6mm threshold resulted in $412 million, and colonoscopy resulted in $377 million.

When comparing the two strategies, colonoscopy dominated capsule endoscopy as it was less costly and more effective even when a 6mm threshold for postcapsule polypectomy was used in capsule endoscopy.

An incremental analysis was performed. Compared with no screening, colonoscopy resulted in an incremental cost of $16,165 per LYS and capsule endoscopy in $29,244 per LYS.

The most influential parameters were the accuracy of capsule endoscopy and the compliance rate, especially in relation to the more invasive colonoscopy. The incremental cost-effectiveness ratio for capsule endoscopy fell below $100,000 when the compliance rate for colonoscopy was at least 30 percentage points less than that for capsule endoscopy.

Authors' conclusions
The authors concluded that the cost-effectiveness of capsule endoscopy was associated with its potential to promote compliance in the general population.

CRD commentary
Interventions:
The interventions were clearly reported. However, relevant available screening methods such as computerised tomography colonography were not considered, which means that, in effect, the study was only a partial analysis. This was correctly acknowledged by the authors as a limitation to their study.

Effectiveness/benefits:
The effectiveness data were derived from published studies. No systematic search of the literature was reported. It is not possible to judge the quality of the data given the information reported in this paper. Uncertainty of all model parameters was investigated in sensitivity analyses. However, the authors presented only a limited number of results, which they justified as being the most relevant. LYS was an adequate measure of benefit given the significant mortality from colorectal cancer.

Costs:
The costs appeared to reflect the perspective stated by the authors. The unit cost data and price adjustment methods were all reported. The authors gave references but did not describe the sources for most of the costs. The authors included work absentee data for the day of the screening, but there was no discussion about work absentee days lost or gained due to changes in CRC rates due to different screening strategies. The cost data were derived from official national sources and appeared to be appropriate for the study population and setting. Uncertainty around the cost estimates was investigated and the relevant results were presented.

Analysis and results:
The model structure was presented graphically along with the modelling assumptions. The health states, time horizon and model parameters were appropriately presented. An incremental cost-effectiveness analysis was appropriately performed. Although the authors do not appear to have presented the results of the sensitivity analyses inappropriately, only the most relevant results were reported. The authors reported some limitations to their study and discussed the
possible impact of these on their findings.

Concluding remarks:
The authors did not demonstrate the use of the best available evidence. However, the analysis was transparent and the conclusions appear to be appropriate.

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