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 determined the cost-effectiveness of various diagnostic strategies for patients with obscure gastrointestinal bleeding, including push enteroscopy, intraoperative enteroscopy, angiography, initial anterograde double-balloon enteroscopy (DBE) followed by retrograde DBE if patients had ongoing bleeding, and small-bowel capsule endoscopy (CE) followed by DBE. The authors concluded that DBE was a cost-effective approach, but CE-directed DBE might lead to better long-term outcomes. The study was well conducted and satisfactorily reported and the authors’ conclusions appear to be valid.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to determine the cost-effectiveness of various diagnostic strategies for the management of patients with obscure gastrointestinal bleeding.

Interventions
The strategies were: no investigation (reference strategy); push enteroscopy; intraoperative enteroscopy; angiography; initial anterograde double-balloon enteroscopy (DBE) followed by retrograde DBE if the patients had ongoing bleeding; and small-bowel capsule endoscopy (CE) followed by DBE guided by the CE findings.

Location/setting
USA/hospital.

Methods
Analytical approach:
The analysis was based on a decision model simulating the outcomes of the five diagnostic strategies and no investigation, followed by a Markov model that projected the disease progression over a one-year time horizon in a hypothetical 50-year-old patient with obscure overt bleeding. The authors stated that the perspective of the third-party payer was adopted.

Effectiveness data:
The clinical data were derived from a thorough search of the MEDLINE database, excluding articles published only as abstracts and case series. The authors provided key details of the methodological characteristics, patient profiles, and results of these source studies, most of which were clinical trials or prospective studies. The most important clinical endpoint was the accuracy of the diagnostic tests. Average values weighted by the sample size were calculated and some assumptions were also necessary.

Monetary benefit and utility valuations:
The utility values were based on published sources and expert opinions. Different sources were used for different health states.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure. Other model outputs such as the number of patients with bleeding cessation and the number of deaths were also reported, but were not combined with the costs.
Cost data:
The economic analysis included the costs of the diagnostic procedures, treatment of complications including emergency department visits and hospitalisations, and omeprazole therapy. A breakdown of the cost items was reported. The cost of DBE, a novel procedure, was calculated using an authors’ estimate of the time required to perform it in comparison with other procedures. Other costs were based on Medicare reimbursement rates and Current Procedural Terminology codes. All costs were in US dollars ($) and the price year was not explicitly reported.

Analysis of uncertainty:
The issue of uncertainty was investigated by means of one-, two-, and multi-way sensitivity analyses using published ranges of values. A Monte Carlo simulation was performed by assigning triangular distributions to the model inputs. In a hypothetical scenario, a long-term time horizon was also considered.

Results
The average costs per patient over one year were $532 with no therapy; $1,025 with push enteroscopy; $2,407 with DBE; $3,215 with angiography; $4,309 with CE-directed DBE; and $21,263 with intraoperative enteroscopy. The QALYs gained were 0.870 with no therapy; 0.888 with push enteroscopy; 0.956 with DBE; 0.899 with angiography; 0.942 with CE-directed DBE; and 0.939 with intraoperative enteroscopy.

Except for push enteroscopy, all the interventional strategies were dominated by DBE, which was both more effective and less expensive. The incremental cost per QALY gained with DBE over no therapy was $20,833.

The most influential model inputs were the quality-of-life scores associated with the well state and with bleeding, the probability of arteriovenous malformations, the haemorrhage-related mortality, procedure-related complication rates, and the DBE cost. In general, the base-case results were robust, but initial CE became an attractive option in several scenarios, especially when considering long-term outcomes, due to the reduced DBE workload and the lower number of procedure-related complications. CE-directed DBE was also the most effective strategy after seven years of simulation.

The stochastic simulation showed that the probability that DBE was cost-effective at a threshold of $50,000 per QALY was 86% and at $100,000 per QALY it was 99%.

Authors’ conclusions
The authors concluded that a strategy of initial DBE was a cost-effective approach, but CE-directed DBE might lead to better long-term outcomes.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear in that the diagnostic strategies were the current options for this patient population.

Effectiveness/benefits:
The clinical analysis was well conducted. The data sources were identified through a systematic approach, which ensured the use of the most relevant estimates. The details of these sources were reported, which enhances the transparency of the analysis. The estimates used were based on values that took into account the number of patients included in each study. The authors did not appear to consider the issue of heterogeneity across studies, but potentially uncertain estimates were varied in the sensitivity analysis. The benefit measure was appropriate for capturing the impact of the interventions on patients’ health, and QALYs can be compared with the benefits of other health care interventions. A number of disease-specific outputs were also reported and may have been more relevant for clinicians.

Costs:
The categories of costs were consistent with the perspective. The authors justified the exclusion of some costs, such as cardiopulmonary complications from conscious sedation. Some costs were broken down into individual items, but others were presented as macro-categories. This approach reflected the accounting system of the reimbursement...
authority. The analysis may be difficult to replicate in other time periods as the price year was not explicitly reported.

Analysis and results:
The analytical approach used to identify the most cost-effective strategy was valid, but the reason for excluding push enteroscopy from the final incremental analysis was not stated. The issue of uncertainty was satisfactorily addressed using various approaches, which considered different aspects of uncertainty. An extensive description of the decision model and its transition patterns was provided. The authors acknowledged that a potential limitation of their analysis was the short time-horizon, but the one-year time frame was used due to the lack of reliable long-term data in the literature. It was also stated that these results were specific for patients aged 50 years and that different results might be found for younger patients.

Concluding remarks:
The study was well conducted and satisfactorily reported and the authors’ conclusions appear to be valid.

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