Cost effectiveness of alternative imaging strategies for the diagnosis of small-bowel Crohn's disease
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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 estimate the cost-effectiveness of alternative approaches to diagnosing small-bowel Crohn's disease. This depended on the pre-test probability of Crohn's disease and the success of ileocolonoscopy. Computed tomography enterography was cost-effective after a negative ileocolonoscopy for patients with a high probability of disease. Capsule endoscopy was not a cost-effective third test. The reporting of the results was satisfactory, but there were some limitations to the reporting of the methods. The authors' conclusions should be considered with caution.

**Type of economic evaluation**
Cost-utility analysis

**Study objective**
The objective was to estimate the cost-effectiveness of alternative approaches to diagnosing small-bowel Crohn's disease in patients with symptoms suggestive of the disease.

**Interventions**
Five diagnostic strategies were evaluated: ileocolonoscopy alone; ileocolonoscopy with follow-up small-bowel follow-through (SBFT) if the ileocolonoscopy was negative; ileocolonoscopy with follow-up computed tomography (CT) enterography if the ileocolonoscopy was negative; ileocolonoscopy with follow-up SBFT if the ileocolonoscopy was negative, and then capsule endoscopy if the SBFT was negative; ileocolonoscopy with follow-up CT enterography if the ileocolonoscopy was negative, and then capsule endoscopy if the CT enterography was negative.

Two patient groups were considered: those with a low pre-test probability of small-bowel Crohn's disease (0.20) and those with a high pre-test probability of the disease (0.75).

**Location/setting**
USA/secondary care.

**Methods**
*Analytical approach:*
A Markov model was developed to determine the costs and outcomes for each strategy for a hypothetical 30-year old man or women. A lifetime horizon was used and the authors reported that a societal perspective was adopted.

*Effectiveness data:*
The key clinical parameters were the diagnostic accuracy of the tests, defined as their sensitivity and specificity, which were from a small prospective study. Other key clinical parameters included the diagnostic test complication rates.

*Monetary benefit and utility valuations:*
The utility weights for Crohn's disease were from published studies and those for the other health states were from the literature or expert opinion.

*Measure of benefit:*
The main measure of benefit was quality-adjusted life-years (QALYs). Life-years were also considered. Both measures
were discounted at an annual rate of 3%.

**Cost data:**
The costs included the direct health care costs of diagnostic tests, surgery, and in-patient and out-patient care, the out-of-pocket expenses, and the patient's time. The cost estimates were from various sources. For example, the cost of the diagnostic tests was from the Medicare payment schedule, while the cost of test complications was from the literature and expert opinion. The direct costs of treating Crohn's disease were from a US insurance claims database. The cost of patient time was based on the median hourly rate of the employed US population. The price year was 2007 and costs were adjusted using the gross domestic product deflator. All costs were converted to US dollars ($) and future costs were discounted at an annual rate of 3%.

**Analysis of uncertainty:**
One-way, two-way, and multivariate sensitivity analyses were performed to assess the impact on the results of varying the key model estimates. An alternative scenario assuming that ileocolonoscopy failed to intubate the terminal ileum, was considered for each strategy.

**Results**
If the terminal ileum was intubated successfully (base case), in patients at low (0.20) pre-test probability of small-bowel Crohn's disease, ileocolonoscopy dominated all other strategies as it was less costly and more effective. In patients with a high (0.75) pre-test probability of disease, the incremental cost-effectiveness ratio (ICER) of ileocolonoscopy with follow-up CT enterography was $54,212 compared with ileocolonoscopy alone. Ileocolonoscopy followed by SBFT was dominated by ileocolonoscopy with CT enterography.

In the alternative scenario where the ileocolonoscopy failed to intubate the terminal ileum, in patients with a low pre-test probability, the ICER of ileocolonoscopy with SBFT was $30,636 per QALY gained, while the ICER of ileocolonoscopy with CT enterography was $298,970. The other two strategies were dominated. In patients with high pre-test probability, the ICER of ileocolonoscopy with SBFT was $20,480 per QALY gained, while ileocolonoscopy with CT enterography resulted in an ICER of $36,952 compared with ileocolonoscopy with SBFT.

All ICERs for the three-stage testing strategies were over $500,000 or the strategies were dominated.

The results were sensitive to the accuracy of the diagnostic tests.

**Authors' conclusions**
The authors concluded that the cost-effectiveness of diagnostic strategies for small-bowel Crohn's disease depended on the pre-test probability of Crohn's disease and if the terminal ileum was successfully examined at ileocolonoscopy. CT enterography was cost-effective after a negative ileocolonoscopy for patients with a high probability of disease. Capsule endoscopy was not a cost-effective third test.

**CRD commentary**
**Interventions:**
The interventions were well described and appear to have been appropriate for the authors' setting.

**Effectiveness/benefits:**
In general, few details of the sources for and methods used to identify the effectiveness data were provided; they appear to have been a combination of published studies and expert opinion. This makes it difficult to assess if the most relevant and up-to-date evidence was used. The studies were not described fully, making it difficult to judge the validity of the evidence. The low pre-test probability of small-bowel Crohn's disease was from a published survey, but it was unclear if this also supplied the high pre-test probability. QALYs were an appropriate measure of benefit as they capture the impact of the intervention on both quality of life and survival. The sources for the utility estimates for Crohn's disease were reported, but the methods of these sources were not.

**Costs:**
The costs reflected the stated perspective. The main sources for the cost estimates were reported and they appear to
have been appropriate to the study setting. A breakdown of individual costs items and the resource use were not reported, which reduces the transparency of the analysis. The price year was reported, enabling future inflationary exercises. Future costs were appropriately discounted.

**Analysis and results:**
The analytic approach was appropriate and a diagram of the model was provided. An appropriate incremental analysis was performed and the results were generally well reported and discussed. The uncertainty was partly investigated in a sensitivity analysis, but probabilistic sensitivity analysis could have better captured the overall parameter uncertainty. The authors discussed some limitations of their analysis including the uncertainty around the estimates of test accuracy.

**Concluding remarks:**
The reporting of the results was satisfactory, but there were some limitations to the reporting of the methods and the authors’ conclusions should be considered with caution.

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