Impact of technology overlapping: a case study on colorectal cancer screening  
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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 examined overlapping technology by assessing the cost-effectiveness of the faecal occult blood test, flexible sigmoidoscopy, barium enema, colonoscopy, and virtual colonoscopy in screening for colorectal cancer. The authors concluded that overlapping technology for colorectal cancer screening was not cost-effective, from the perspective of the health care payer, compared with each test alone. The cost-effectiveness framework was conventional, but there were some limitations in the reporting of the data sources that might affect the validity of the authors’ conclusions.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined overlapping technology by assessing the cost-effectiveness of the faecal occult blood test (FOBT), flexible sigmoidoscopy, barium enema, colonoscopy, and virtual colonoscopy, in screening for colorectal cancer, in individuals aged 50 years or older.

Interventions
The interventions were overlapping technologies for screening, which included all the colorectal cancer screening tests (FOBT, flexible sigmoidoscopy, barium enema, colonoscopy, and virtual colonoscopy) at a combination of use, based on their percentage use in Italy, compared with each test individually. Positive results for FOBT, flexible sigmoidoscopy, and barium enema were followed-up with colonoscopy.

Location/setting
Italy/primary care.

Methods
Analytical approach:
The analysis was based on a decision model, followed by a Markov simulation model. The decision tree described the implementation of screening and the Markov model simulated the development of disease. A lifetime horizon was considered. The authors stated that the analysis was carried out from the perspective of the Italian National Health Service.

Effectiveness data:
The clinical data were from a selection of relevant studies and a survey of experts. The proportion of patients undergoing each test was the key input for the model for the overlapping scenario. These data were from regional databases of 2003 to 2005 out-patient records and from the survey of general practitioners (GPs), endoscopists, and radiologists (experts), which provided the data on attitudes, knowledge, and practice in colorectal cancer screening. The mortality data were from published literature and the National Health Institute.

Monetary benefit and utility valuations:
The utility values were derived from published sources.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and they were discounted at an annual rate of 5%.
Cost data:
The economic analysis included the direct medical costs of the colorectal cancer screening tests, the treatment of screening-related complications, and the treatment of colorectal cancer, which depended on the disease stage. The unit costs were reported for the screening tests; the other costs were presented as category totals. The costs of screening were from regional out-patient fees, and those of treatment were from published studies. All costs were in Euros (EUR) and a 5% annual discount rate was applied.

Analysis of uncertainty:
Deterministic sensitivity analyses were carried out on the initial distribution of screening tests in the overlapping scenario, the performance of FOBT and colonoscopy, the utility parameters, the initial distribution of Dukes' stages of cancer, and the mortalities. The ranges of values were the consensus of a committee of hospital clinicians, health economists, and health managers.

Results
Compared with the overlapping strategy, FOBT had an incremental cost of EUR 289.6 and gained 0.01 QALYs; flexible sigmoidoscopy saved EUR 505.2 and gained 0.12 QALYs; barium enema saved EUR 2.5 and gained 0.10 QALYs; colonoscopy saved EUR 301.6 and lost 0.089 QALYs; and virtual colonoscopy saved EUR 371.8 and gained 0.32 QALYs.

The incremental analysis showed that flexible sigmoidoscopy, barium enema, and virtual colonoscopy were less expensive and more effective than the overlapping scenario, which was dominated. FOBT had an incremental cost per QALY gained over the overlapping scenario of EUR 22,405, which was below the cost-effectiveness threshold of EUR 35,000 per QALY. Colonoscopy was less effective and less costly and the incremental cost per QALY for the overlapping strategy was EUR 3,387.

In general, the conclusions of the base case were robust to the variations considered in the sensitivity analyses. The overlapping scenario became cost-effective when a different distribution of tests was assumed. For example, with less FOBT, more colonoscopy or virtual colonoscopy and no flexible sigmoidoscopy and barium enema, the overlapping scenario was more cost-effective than FOBT.

Authors' conclusions
The authors concluded that overlapping technology for colorectal cancer screening was not cost-effective, from the perspective of the health care payer.

CRD commentary
Interventions:
The selection of the comparators was appropriate as the authors included the most common screening strategies in Italy. Genetic testing and emerging technologies were not considered as they were not common practice.

Effectiveness/benefits:
The distribution of tests for the overlapping strategy aimed to reflect the Italian situation and was from a survey of Italian experts, as there was a lack of valid published data. The response rate for this survey was very low (19%). The data from the literature for the model parameters were not described, and it is not possible to judge their validity. Some data were varied in the sensitivity analysis. QALYs were a valid measure, as colorectal cancer has an impact on survival and quality of life. They can also be compared with the benefits for disease interventions.

Costs:
The economic analysis was consistent with the perspective adopted. The authors stated that the costs of developing a screening programme were not considered because the analysis focused on the screening tests per patient pathway. The unit costs were reported for some items, but most of the data were presented as aggregate figures. The data sources were not clearly described, reducing the transparency of the analysis. Reflation exercises will not be possible, as the price year was not reported. Alternative cost estimates were not considered in the sensitivity analyses.

Analysis and results:
An appropriate incremental approach was used to synthesise the costs and benefits of the alternative strategies. The authors reported only the incremental costs and benefits compared with the overlapping strategy. The uncertainty was investigated, using a deterministic approach, but the authors acknowledged that a probabilistic analysis would have been more appropriate. It is unclear why the authors stated that the overlapping strategy was not cost-effective compared with colonoscopy, as its incremental cost per QALY was below their threshold. The authors did not discuss the transferability of the results and they should be considered to be specific to the Italian context.

Concluding remarks:
The cost-effectiveness framework was conventional, but there were some limitations in the reporting of the data sources that might affect the validity of the authors' conclusions.

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