Cost-effectiveness analysis of a quantitative immunochemical test for 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
The objective was to identify the most cost-effective faecal immunochemical test (FIT) cut-off level for referral to colonoscopy, in screening for colorectal cancer. The authors concluded that, compared with higher levels, the best cut-off for FIT screening was 50 nanograms of haemoglobin per mL. The methods were good and the results were adequately reported. Given the scope of the study, the authors’ conclusions appear to be appropriate.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective was to identify the most cost-effective faecal immunochemical test (FIT) cut-off level for referral to colonoscopy, in screening for colorectal cancer.

Interventions
The cut-off levels were 50, 75, 100, 150, or 200 nanograms (ng) of haemoglobin per mL. For each cut-off, there were 48 combinations of starting age for screening (45, 50, 55, or 60 years); ending age for screening (70, 75, or 80 years), and screening interval (one, 1.5, two, or three years).

Location/setting
Netherlands/primary care.

Methods
Analytical approach:
The authors used the Microsimulation Screening Analysis (MISCAN)-COLON model (Loeve, et al. 1999, see ‘Other Publications of Related Interest’ below for bibliographic details) to estimate the costs and effects of the screening strategies and FIT cut-off levels. The time horizon was the lifetime of the patient (maximum 30 years). The authors did not explicitly state the perspective.

Effectiveness data:
Many parameters, such as the natural history of colorectal cancer, treatment effectiveness, and mortality, were those used in the MISCAN-COLON model. The specificity and sensitivity of the FITs with different cut-off levels were from two published randomised controlled trials, conducted in the Netherlands. These compared the guaiac-based faecal occult blood test to the quantitative FIT. The authors assumed 100% screening attendance in the base case.

Monetary benefit and utility valuations:
The utility values (for screening and cancer treatment) were from published studies.

Measure of benefit:
Life-years gained were the summary benefit measure. Quality-adjusted life-years (QALYs) gained were considered in the sensitivity analysis. Future benefits were discounted at an annual rate of 3%.

Cost data:
The costs included those of the FIT (organisation, kits, materials, and personnel for registration, analysis, and returned
tests); colonoscopy; complications after colonoscopy; and cancer treatment (initial, continued, and terminal care).

Screening costs were from the Dutch cervical cancer screening programme, and were adjusted to apply to the FIT. The cost of the test kit was its manufacturer's price. The colonoscopy costs came from a six-month study by the Erasmus Medical Centre, in the Netherlands. The cost of complications after colonoscopy and colorectal cancer treatment were Diagnosis Treatment Combination rates from the Dutch Health Authority. All costs were reported in Euros (EUR). Future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:
Sensitivity analyses were undertaken by varying seven model parameters and surveillance rules. Quality adjustment of life-years was considered.

Results
The cut-off level of 50ng per mL produced more life-years at equal or lower costs than other cut-off levels.

With a cut-off of 50ng per mL, excluding strategies that were dominated as they were less effective and more costly than another option, the costs per 1,000 people, were EUR 91,000 with three-yearly screening from 60 to 69 years, EUR 131,000 to EUR 273,000 for screening from 55 years, EUR 293,000 to EUR 344,000 for screening from 50 years, and EUR 397,000 to EUR 515,000 for screening from 45 years.

The life-years gained per 1,000 people were 57 with three-yearly screening from 60 to 69 years, 75 to 110 with screening from 55 years, 114 to 119 with screening from 50 years, and 125 to 133 with screening from 45 years.

The incremental cost per life-year gained was less than EUR 20,000, for all comparisons. The most effective option was annual screening from 45 to 80 years, and the incremental cost per life-year gained, compared with the next most effective option, 1.5-yearly screening from 45 to 79.5 years, was EUR 14,900.

The sensitivity analyses showed that when attendance rates were reduced from 100% to those observed in screening programmes, the FIT with a 50ng per mL cut-off and annual screening from 45 to 80 years remained the most cost-effective option. The QALY results were very similar to those for life-years.

Authors' conclusions
The authors concluded that, compared with higher cut-off levels, the best cut-off for FIT screening was 50ng per mL.

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

Effectiveness/benefits:
The screening sensitivity and specificity for each cut-off level were from two published Dutch randomised controlled trials, which should have been of high quality. Brief details of these trials were reported and their references were provided. Other parameters, such as the treatment effectiveness, were incorporated in the MISCAN-COLON model and the original studies should be reviewed to assess the quality of this evidence. Several studies based on this model have been published and validated, and it is likely that all the relevant information was included. The main measure of benefit (life-years) was appropriate, but QALYs might have been more appropriate as they evaluate survival and quality of life; these were investigated in the sensitivity analysis.

Costs:
The authors did not explicitly report the perspective, but it appears that a health care system perspective was adopted and all the categories of costs relevant to this perspective were analysed. The authors reported the sources for the costs and in most cases they were standard Dutch sources. They did not report the price year, hampering future inflationary exercises. The time horizon, discount rate, and currency were reported.

Analysis and results:
A published model was used to synthesise the cost and outcome information. No diagram was provided, but the model was described and its reference was given. The main results were clearly presented and an incremental analysis was
appropriately used to identify the optimal screening strategy. The uncertainty was evaluated in one-way sensitivity analyses, and the results were clearly reported and discussed. The authors provided an explanation for not undertaking a probabilistic sensitivity analysis to capture the full impact of overall parameter uncertainty on the results. They reported some limitations to their study, including the assumption that there would be sufficient colonoscopy capacity for the screening programmes.

Concluding remarks:
The methods were good and the results were adequately reported. Given the scope of the study, the authors’ conclusions appear to be appropriate.

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