At what costs will screening with CT colonography be competitive? A cost-effectiveness approach
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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 the cost-effectiveness of screening people aged 50 to 80 years, using colonography by computed tomography, to prevent colorectal cancer. Colonography, offered every five years, with follow-up restricted to findings of 6mm or more, and at a cost not greater than $285 per test, was a cost-effective alternative to conventional colonoscopy. The study was well conducted and more extensive information was reported in an online appendix. The authors' conclusions appear to be robust and valid.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost-effectiveness of screening the general population aged 50 to 80 years, using colonography by computed tomography, to prevent colorectal cancer.

Interventions
Four screening strategies were considered: conventional optical colonoscopy; colonography with referral to colonoscopy for a suspected polyp of any size; colonography with referral to colonoscopy for a suspected polyp of 6mm or more; and colonography with referral to colonoscopy for a suspected polyp of 10mm or more. For each strategy, screening intervals of five, 10, 15, and 20 years were considered.

Location/setting
USA/out-patient.

Methods
Analytical approach:
The analysis was based on a published model, namely the MIcrosimulation SCreening ANalysis (MISCAN)-COLON micro-simulation model, which was developed by the Department of Public Health at Erasmus University in the Netherlands in collaboration with the US National Cancer Institute. A lifetime horizon was considered. The authors did not explicitly state the perspective was adopted, but they did state that all direct costs were considered.

Effectiveness data:
The clinical data came from various published sources and the methods of these were not explicitly reported. Screening accuracy, which was the key input to the model, was based on a published meta-analysis, for colonography, and on published back-to-back colonoscopy studies, for colonoscopy. Epidemiological data and the estimates of disease progression were mainly from the Surveillance, Epidemiology, and End Results (SEER) database. Expert opinions were used where there was a lack of published studies.

Monetary benefit and utility valuations:
Not included.

Measure of benefit:
Life-years (LYs) were the summary benefit measure and they were discounted at an annual rate of 3%.
Cost data:
The economic analysis included the costs of screening procedures (with and without polypectomy), complications requiring in-patient hospitalisation, and treatment of colorectal cancer (initial, continuing, and terminal care). Most of the costs were based on Medicare reimbursement rates; colonography was not reimbursed at the time of the study, so various levels of costs relative to the cost of colonoscopy were considered (equal, 50%, and 33%). All costs were in US dollars ($) and the price year was 2007. A 3% annual discount rate was applied.

Analysis of uncertainty:
Various alternative scenarios were considered using alternative sources of evidence. The threshold price that made the colonography strategy as cost-effective as the colonoscopy strategy was identified. The model inputs were varied to determine their impact on this threshold price.

Results
Depending on the screening interval, the LYs gained in comparison with no screening ranged from 0.096 to 0.123 with colonoscopy; from 0.048 to 0.092 with colonography and referral at 10mm; from 0.068 to 0.111 with colonography and referral at 6mm; and from 0.086 to 0.120 with colonography and referral for all suspected polyps.

Colonoscopy costs ranged from $1,900 to $3,364 with colonoscopy; from $438 to $735 with colonography-10mm; from $769 to $1,289 with colonography-6mm; and from $1,242 to $2,141 with colonography-all. Treatment savings, compared with no screening, ranged from $1,142 to $1,494 with colonoscopy; from $492 to $892 with colonography-10mm; from $767 to $1,236 with colonography-6mm; and from $999 to $1,406 with colonography-all.

When colonography unit costs were equal to colonoscopy costs, colonography was dominated by colonoscopy. When colonography costs were half those of colonoscopy, referral at 6mm was the most cost-effective colonography strategy, but it was only cost-effective over colonoscopy when offered every 15 or 20 years. When colonography costs were one-third of colonoscopy costs, most of the colonography strategies were cost-effective alternatives to colonoscopy, while referral at 6mm remained the preferred strategy.

The threshold analysis showed that, for colonography with referral at 6mm to be as cost-effective as colonoscopy, the costs should not exceed $285 or 43% (range 39 to 47) of the costs of colonoscopy. With 25% greater adherence than colonoscopy, the colonography threshold costs could be 71% of colonoscopy costs.

The sensitivity analysis did not substantially alter these base-case findings.

Authors' conclusions
The authors concluded that colonography was a cost-effective alternative to colonoscopy, provided that colonography was offered every five years, with follow-up restricted to findings of 6mm or more, and at a cost not greater than $285 per test.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear. The authors considered the conventional approach (colonoscopy) and a novel diagnostic tool, namely colonography by computed tomography. Several different screening frequencies and thresholds for referrals to colonoscopy were considered.

Effectiveness/benefits:
The clinical evidence may have been selected by the authors as they did not provide details of the methods and conduct of a literature review. The screening accuracy for colonography, which was the key model input, was from a meta-analysis of studies, which should produce reliable data. Other sources were representative of the US context. The model was validated using published estimates. Life-years were appropriately used as the main measure of benefit, given the impact of the disease on survival. Quality-adjustment would have been useful. Conventional discounting was applied.

Costs:
The categories of costs and their sources suggest the adoption of a modified societal perspective, in which all the direct
costs were considered, but productivity losses were not included. The costs were presented as macro-categories and were not broken down into individual items. Extensive details of the economic analysis were presented in an online appendix. Other aspects of the analysis, such as the price year and use of discounting, were reported.

Analysis and results:
The study results (costs and benefits) were clearly presented. The authors used an incremental approach to identify the best screening strategy, but did not explicitly calculate cost-effectiveness ratios, in accordance with the scope of the analysis, which took a threshold approach. The assessment of uncertainty was restricted to a deterministic approach, which focused on the most influential and uncertain inputs to the model. The authors compared their findings with those of other published economic evaluations and highlighted the differences and similarities.

Concluding remarks:
The study was generally well conducted and more extensive information was reported in an online appendix. The authors' conclusions appear to be robust and valid.

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