Colorectal cancer screening: health impact and cost effectiveness

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 was an update of evidence-based recommendations, made in 2001, on the clinical preventive services for colorectal cancer (CRC) in adults aged 50 years and older. CRC screening was a high-impact, cost-effective health intervention which was underused in US society. The study appears to have been based on valid methodology although it was not extensively reported because the bulk of the methods and findings were presented in a companion paper. The authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study was an update to evidence-based recommendations, made in 2001, on the clinical preventive services for colorectal cancer (CRC) in adults aged 50 years and older. This study focused on two aspects, which were the clinically preventable burden (CPB) and the cost-effectiveness for CRC screening.

Interventions
The three screening options were annual faecal occult blood testing (FOBT), flexible sigmoidoscopy every five years, and colonoscopy every 10 years. The costs and benefits of these strategies were weighted according to the percentage of individuals receiving each screening option (48%, 9% and 43%, respectively) and these weighted averages were compared with a no screening strategy.

Location/setting
USA/primary and secondary care.

Methods
Analytical approach:
This economic evaluation was based on a published model which used data from multiple sources. The time horizon was a lifetime and the authors stated that a societal perspective was adopted.

Effectiveness data:
The clinical evidence was derived from a literature review of electronic databases and a search of the bibliographies of the retrieved articles. When possible, the authors selected the most recent and relevant studies. The burden of disease came from US epidemiological sources such as the Surveillance, Epidemiology, and End Results or the National Cancer Institute databases. The efficacy of FOBT in avoiding CRC deaths came from randomised controlled trials and case-control studies, while the efficacy of sigmoidoscopy and colonoscopy came both from case-control studies and cost-effectiveness models. The adherence to screening options came from observational studies and authors’ opinions. The key clinical outcome was the impact of screening in reducing CRC deaths.

Monetary benefit and utility valuations:
None.

Measure of benefit:
Life-years (LYs) were used as the summary benefit measure. Future benefits were discounted at an annual rate of 3%.

Cost data:
The economic analysis considered the costs of screening plus follow-up services, minus the resource savings from averted disease. A breakdown of cost items was not reported. The value of patient time was also included. The economic analysis relied on a published economic evaluation, the methods and results of which were not extensively reported. All costs were in US dollars ($) and the price year was 2000. Future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:
In the CPB model, a multivariate sensitivity analysis was undertaken by varying the most influential model inputs, using published ranges of values. In an alternative analysis, quality adjustments were applied to the expected survival in order to generate quality-adjusted life-years as the benefit measure. In the cost-effectiveness analysis, the two most influential "aggregate variables", which were life expectancy and net costs, were varied simultaneously using published ranges.

Results
In a cohort of four million eligible individuals who were offered screening at recommended intervals (100% delivery and adherence), 31,500 deaths were prevented and 338,000 LYs were gained over no screening. Given the current delivery rates and adherence, only 10,900 of the 31,300 clinically preventable deaths would be prevented (35%).

At the current relative delivery of FOBT (48%), sigmoidoscopy (9%), and colonoscopy (43%), the cost per LY gained with all CRC screening options was $11,900 in comparison with no screening ($13,334 with FOBT, $18,869 with sigmoidoscopy, and $8,840 with colonoscopy).

The sensitivity analysis indicated that CPB estimates were highly sensitive to the number of deaths attributable to CRC, life expectancy at death, efficacy of colonoscopy, and adherence with screening. The alternative analysis revealed that quality-adjustments had a minor impact on the study findings. In the cost-effectiveness analysis, the incremental cost per LY gained ranged from $5,700 to $22,000.

Authors’ conclusions
The authors concluded that CRC screening was a high-impact, cost-effective health intervention which was underused in US society.

CRD commentary
Interventions:
The authors’ appropriate justification for the selection of the comparators was that they were the most commonly used screening options in their setting. The timing of the screening for each option followed recommended patterns. The three screening options were considered as a single screening group compared with no screening, so, in effect, they were not compared with each other. FOBT combined with sigmoidoscopy every five years and contrast barium enema were excluded given the lack of reliable data on the efficacy of this option.

Effectiveness/benefits:
The approach used to derive the clinical data was described. In general, the use of a systematic literature review represents a valid methodology. The authors discussed the method used to select the clinical inputs from the available literature. In addition, some characteristics of the designs of these sources were provided, which helps in judging the validity of the clinical analysis. In general, the best available evidence was selected. Published ranges of values were tested in the sensitivity analysis. The use of LYs as the summary benefit measure is appropriate given that they allow for cross-disease comparisons. Quality-adjustments were not considered in the base-case because, as the authors pointed out, no valid data were found in the literature.

Costs:
The analysis of costs appears to have been consistent with the perspective. The study used as the basis for the cost-effectiveness of the alternative strategies was identified through a literature review of economic evaluations. The study was finally selected on the grounds of its methodological rigour and the appropriate modelling of two important variables: adherence and the costs of screening. The cost of patient time was added to the costs estimated in the previous model. Since a previous study was used, in the current study there was limited reporting of the economic methods and results.
Analysis and results:
The costs and benefits were appropriately synthesised, but were not extensively reported. Similarly, the sensitivity analysis addressed key uncertain areas, but the findings from these analyses were only partially reported. The authors noted some limitations due to a lack of precise estimates for the CPB model.

Concluding remarks:
The study appears to have been based on a valid methodology although this was not extensively reported given that the bulk of the methods and findings were presented in a companion paper. The authors’ conclusions appear to be robust.

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