Cost-effectiveness analysis of screening by faecal occult blood testing for colorectal cancer in Australia

Salkeld G, Young G, Irwig L, Haas M, Glasziou P

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.

Health technology
A population-based faecal occult blood test (FOBT) to screen for colorectal cancer, with follow-up of positives by colonoscopy.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Individuals between 50 to 80 years of age.

Setting
Primary care. The trial was undertaken in Minnesota, USA, but the economic study was conducted in Australia.

Dates to which data relate
The first phase of the Minnesota trial took place from 1976 to 1982 and the second phase from 1986 to 1994. The Minnesota trial was used to estimate the resource utilisation rate for each group. 1994 prices were used.

Source of effectiveness data
The evidence for complications, incidence of and mortality from colorectal cancer, and the life-years saved were based on data from the Minnesota trial. The percentage of all polyps detected through examination being adenomas was based on the National Polyp Study.

Link between effectiveness and cost data
The costing was performed using the same patient sample as that used in the effectiveness study.

Study sample
The Minnesota study sample consisted of 30,964 individuals who were randomly assigned to either the annual-screen group (Person-years in the study, 184,160) or the control (no screen) group (181,966 persons years). No power calculations were reported.

Study design
The Minnesota study was a randomised controlled trial. The follow-up period was 13 years.

**Analysis of effectiveness**
The principal used in the effectiveness analysis (intention to treat or treatment completers only) was not specified. The clinical outcomes reported were complications, incidence of and mortality from colorectal cancer.

**Effectiveness results**
The main findings from the Minnesota trial during the 13-year follow-up after randomisation were as follows: the cumulative incidence of colorectal cancer was 23 per 1,000 (95% CI: 21 - 26) for the annual screen group and 26 per 1,000 (CI: 23 - 28) for the control group; the cumulative mortality results were 5.88 (CI: 4.61 - 7.15) and 8.83 (CI: 7.26 - 10.4) for the annual-screen and control groups respectively. There were four cases of perforation of the colon per 12,246 colonoscopies carried out and 11 incidents of serious bleeding.

**Clinical conclusions**
The Minnesota trial showed a 33% reduction in colorectal cancer mortality in the annual-screen group compared with the no screen group.

**Modelling**
The probability, costs and consequences of the colorectal screening programme were modelled for a hypothetical cohort of 1,000 individuals. As the period of follow-up for the primary study was for 13 years only, a simple linear projection was used to extend the two survival curves until the final endpoint of death.

**Measure of benefits used in the economic analysis**
The main outcome measure used was life-years saved. To extrapolate outcome results beyond the 13 year follow-up period until death, a simple linear projection of the screen and control group survival curves was undertaken. Health states were estimated on the basis of the Minnesota study.

**Direct costs**
Costs were discounted. Quantities were not reported separately. Costs were reported separately. The following direct health care costs were included: screening, diagnostic work-up, treatment, palliation and follow-up surveillance. The cost analysis was performed from the perspective of a health care system. Estimations of quantities were based on actual data from the Minnesota trial and through the modelling used to project data beyond the 13 year trial follow-up period. Australian cost estimates were used to value the resource utilisation. The costs of three cases of surgery due to serious bleeding were not included.

**Indirect Costs**
Not given.

**Currency**
Australian dollars (Aus$).

**Sensitivity analysis**
Simple one-way sensitivity analysis was performed on the following variables; mortality reduction estimates (life-years gained), cost of colonoscopy, cost of FOBT, false positive rate, surveillance strategy and discount rate. The variability in data was tested.
Estimated benefits used in the economic analysis
Total discounted life years saved for the annual screen group was -56.41 versus -73.11 for the no screen group. The duration of the follow-up in the economic study was lifetime. The discount rate was 5%. Side-effects of treatment such as serious bleeding following colonoscopy were considered although the number of cases was very small. These cases were, therefore, not considered within the analysis.

Cost results
The discount rate was 5%. The total intervention cost Aus$953,380 versus Aus$541,497 for the control group. The costs of three cases of surgery due to serious bleeding were not included.

Synthesis of costs and benefits
Estimated costs and benefits were combined as incremental cost per life-year saved (LYS). Incremental analysis was performed. The incremental cost per life-year saved was estimated to be Aus$24,660 per LYS. Sensitivity analysis revealed a considerable variability in the incremental cost-effectiveness ratio.

Authors’ conclusions
The cost-effectiveness of annual colorectal screening is around Aus$24,660 per life-year saved and this is acceptable when compared with other comparable screening programmes. Study results were variable especially with regard to efficacy, test characteristics and the cost of diagnostic work-up. The majority of the Salkeld et al study was based on data from the Minnesota trial. As the authors say, the outcome results from that trial were optimistic and it is only when the screening test and subsequent actions lead to reduced mortality or morbidity that effectiveness is assured. Hence the benefits of colorectal cancer screening must be evident before health policy planners commit resources to mass screening.

CRD COMMENTARY - Selection of comparators
The reason for the choice of comparator is clear.

Validity of estimate of measure of benefit
The estimate of benefit measure is likely to be internally valid because of randomisation.

Validity of estimate of costs
Resource quantities were not reported separately from costs. Adequate details of the methods of cost estimation were given. All important costs have been included.

Other issues
As acknowledged by the authors, using the clinical outcomes of a trial that started 15 years ago and extending the results to today’s health care settings may cause a number of difficulties. As no statistical analysis of costs was performed, the results of costs analysis may not be generalisable to other settings or countries. Appropriate comparisons with other studies were made.

Source of funding
None stated.

Bibliographic details