Value-of-information analysis to guide future research in the management of the colorectal malignant polyp

Hassan C, Pickhardt PJ, Di Giulio E, Hunink MG, Zallo A, Buongiorno Nardelli B

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 strategies for the management of low-risk malignant polyps after endoscopy, by referral to surgery or not, in order to find the expected value of more information for uncertain parameters. The authors concluded that surgery might not be the best approach for low-risk malignant polyps, unless the accuracy of histopathology was not perfect. The methods were valid and the key areas of uncertainty were investigated. The authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost-effectiveness of strategies for the management of low-risk malignant polyps after endoscopy, by referral to surgery or not, in order to find the expected value of more information for uncertain parameters.

Interventions
Referral to surgery was compared against expectant management for patients with low-risk malignant polyps after complete endoscopic resection.

Location/setting
USA/secondary care.

Methods
Analytical approach:
The analysis was based on a decision tree that simulated the clinical and economic consequences of the two strategies, in a hypothetical cohort of 10,000 adults aged 60 years. A lifetime horizon was considered and the authors did not explicitly state the perspective adopted.

Effectiveness data:
The clinical inputs appear to have been derived from a selection of relevant studies. The methods were reported only for a few of the studies, such as a pooled data analysis based on a systematic review of the literature, which provided the relative prevalence of low- and high-risk polyps among malignant polyps. Other epidemiological data were from sources that were not fully reported, but were US studies, where possible. The accuracy of histology was the key model input and was assumed to be 100% in the base case.

Monetary benefit and utility valuations:
Not considered.

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

Cost data:
The economic analysis considered three cost categories: surgery, for patients without residual disease, and treatment of
regional and distant colorectal cancer. The costs of treatment of regional and distant cancer included those resources consumed in the initial phase (first year following the diagnosis), the continuing phase (after one year and before the last year), and terminal phase (last year of life for those dying from cancer). These costs were estimated using Medicare reimbursement rates and the component items were not reported. The price year was not reported. All costs were in US dollars ($).

Analysis of uncertainty:
The issue of uncertainty was investigated using probabilistic analysis, with a Monte Carlo simulation and a multivariable normal distribution for the model inputs, and the expected value of perfect information (EVPI) was calculated for the entire population, using published data on the prevalence and population size. Selected model inputs and assumptions were also varied, using alternative values from the literature or estimated by the authors, in one- and two-way deterministic sensitivity analyses.

Results
The expected costs per person were $1,360 with waiting and $26,350 with surgery. The LYs per person were 23.6 with waiting and 23.7 with surgery. In a cohort of 10,000 individuals waiting produced a loss of 3,672 LYs due to erroneous diagnoses, while surgery produced a loss of 2,511 LYs due to erroneously diagnosed cancer (1,311) and mortality from surgery (1,200). The incremental cost per LY gained with surgery over waiting was $215,291, which was far above the threshold, proposed by the authors, of $150,000 per LY gained.

The sensitivity analysis favoured the waiting strategy in most scenarios. Surgery approached the cost-effectiveness threshold, when the prevalence of residual disease, in patients with low-risk polyps, increased from 1.7% (baseline estimate) to 2.1% or when there was a 1% rate of high-risk polyps misclassified as low risk.

The probabilistic analysis showed that surgery was the best strategy in 61% of iterations, but there was a high degree of uncertainty. The total EVPI was $16,647 per patient, resulting in a population EVPI estimate of over $1 billion. The most uncertain area of research was histological accuracy, followed by the prevalence of residual disease and surgical mortality.

Authors' conclusions
The authors concluded that surgery was not the best approach for low-risk malignant polyps, due to the small benefit compared with waiting, but when the accuracy of histopathology was not assumed to be perfect, surgery became cost-effective.

CRD commentary
Interventions:
The two strategies were appropriately selected to model a conservative one against an intervention. They were also likely to be valid comparators in other settings.

Effectiveness/benefits:
The sources of clinical evidence appear to have been selected, without a literature review. Few details on these sources were reported, which hinders an objective assessment of the quality of the evidence. The issues around mixing data from different sources were not discussed, but an extensive sensitivity analysis was carried out to assess the uncertainty around these clinical estimates and the value of information was calculated to assess the importance of reducing the uncertainty in these clinical parameters. LYs were an appropriate benefit measure, not only because survival is the key outcome for patients at risk of colorectal cancer, but also because they can be compared with the benefits of other health care interventions.

Costs:
Little information was given on the costs. The perspective was not explicitly stated, but it appears to have been that of the third-party payer, given the sources of costs. A list of cost items was not provided and the unit costs and resource consumption patterns were not reported. The price year was not stated and this limits the transparency of the economic analysis and the possibility of replicating this analysis for other time periods. The cost estimates were varied in the sensitivity analysis. Discounting was not reported and it would have been relevant, given the lifetime length of the
Analysis and results:
The costs and benefits of the study were explicitly reported and were appropriately synthesised in an incremental analysis. The net benefit was also calculated for the two strategies. The issue of uncertainty was satisfactorily investigated and the key findings were discussed and illustrated. The authors acknowledged some limitations of their analysis and these were mainly due to the need for some important assumptions.

Concluding remarks:
The methods were valid and the key areas of uncertainty were investigated. The authors’ conclusions appear to be robust.

Funding
Not reported.

Bibliographic details

PubMedID
20087087

DOI
10.1007/DCR.0b013e3181c3be55

Original Paper URL

Indexing Status
Subject indexing assigned by NLM

MeSH
Aged; Biomedical Research /standards; Colonic Polyps /diagnosis /economics /surgery; Colonoscopy /methods /standards; Colorectal Neoplasms /diagnosis /economics /surgery; Cost-Benefit Analysis; Decision Making; Guidelines as Topic; Health Care Costs /statistics & numerical data; Humans; Middle Aged; ROC Curve; Treatment Outcome

AccessionNumber
22010000539

Date bibliographic record published
23/06/2010

Date abstract record published
21/07/2010