Assessing the cost effectiveness of using prognostic biomarkers with decision models: case study in prioritising patients waiting for coronary artery surgery


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 assessed the cost-effectiveness of various strategies, with or without biomarkers, for prioritising patients awaiting coronary artery bypass graft surgery. The authors concluded that formal prioritisation using a routinely assessed biomarker, such as the estimated glomerular filtration rate, was good value for money for the UK National Health Service, while C reactive protein was unlikely to be cost-effective. The study was very well conducted and more details were presented in other publications. The authors' conclusions are robust.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of various strategies with and without biomarkers for prioritising patients with stable angina awaiting coronary artery bypass graft surgery (CABG).

Interventions
The analysis considered four strategies without biomarkers and three strategies with them. The strategies without biomarkers were no formal prioritisation, Ontario urgency score, New Zealand urgency score, and a risk score. The strategies with biomarkers to determine the risk score were a routinely assessed biomarker (estimated glomerular filtration rate, eGFR), a novel biomarker (C reactive protein, CRP), and a combination of these two.

Location/setting
UK/hospital.

Methods
Analytical approach:
The economic evaluation was based on a decision analytic model with a lifetime horizon. The authors stated that the analysis was carried out from the perspective of the UK National Health Service (NHS).

Effectiveness data:
The clinical data came from a selection of known, relevant studies, including two main sources. The risk of events while on the waiting list was from a large prospective database; the Swedish Coronary Angiography and Angioplasty Registry, which included 9,935 patients with stable angina, who were followed-up for 3.8 years after their CABG. The prognostic effect of biomarkers, which was the key clinical input, was estimated by undertaking a systematic review of the literature in the MEDLINE and EMBASE databases and then using meta-analysis to synthesise the evidence identified. The details of the methods and conduct of the review were published elsewhere.

Monetary benefit and utility valuations:
The utility valuations were derived from a published Health Technology Assessment (HTA) report.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and were discounted at an annual rate of 3.5%.

Cost data:
The economic analysis included the costs associated with the use of biomarkers, CABG, and treatment of ischaemic heart disease with and without events, such as myocardial infarction or stroke. No information on the sources and unit costs was provided as most of the economic data were from a published HTA report. All costs were in UK pounds sterling (£) for the fiscal year 2006 to 2007. Those costs incurred after the first year were discounted at a 3.5% per annum.

Analysis of uncertainty:
The issue of uncertainty was investigated by considering three maximum waiting times (15, 40, and 90 days) and alternative scenarios, including changes in the cost of the biomarker tests and the use of confidence intervals for the predictive effect of biomarkers on cardiovascular events.

Results
After excluding the dominated strategies (which were less effective and more expensive than at least one other strategy) the lifetime costs were £16,099.77 at a waiting time of 90 days, £16,095.47 at 40 days, and £16,093.22 at 15 days, with no formal prioritisation; £16,100.00 at 90 days, £16,095.53 at 40 days, and £16,093.24 at 15 days, with Ontario urgency score; £16,102.22 at 90 days, £16,096.47 at 40 days, and £16,093.57 at 15 days, with eGFR; and £16,108.19 at 90 days, £16,102.46 at 40 days, and £16,099.57 at 15 days, with the combination of CRP and eGFR.

The QALYs were 8.2796 at 90 days, 8.2973 at 40 days, and 8.3062 at 15 days, with no prioritisation; 8.2822 at 90 days, 8.2984 at 40 days, and 8.3066 at 15 days, with Ontario; 8.2877 at 90 days, 8.3009 at 40 days, and 8.3075 at 15 days, with eGFR; and 8.2878 at 90 days, 8.3009 at 40 days, and 8.3075 at 15 days, with CRP and eGFR.

The incremental cost per QALY gained over the next less expensive strategy was £88 at 90 days, £55 at 40 days, and £31 at 15 days with Ontario urgency score over no formal prioritisation. It was £405 at 90 days, £380 at 40 days, and £362 at 15 days with eGFR over Ontario urgency score and £57,842 at 90 days, £133,287 at 40 days, and £374,371 at 15 days, with CRP and eGFR over eGFR alone.

These results were not altered by any of the scenarios considered in the sensitivity analyses, but the cost-effectiveness of novel biomarkers (CRP) was sensitive to variations in the cost of the tests.

Authors' conclusions
The authors concluded that formal prioritisation using a routinely assessed biomarker, such as eGFR, was good value for money from the perspective of the UK NHS, while the use of novel biomarkers, such as CRP, was unlikely to be cost-effective.

CRD commentary
Interventions:
The authors stated that the selection of the comparators was based on either their relevance in the current health care setting or their potential use.

Effectiveness/benefits:
The sources of the clinical data were generally appropriately selected. The cohort chosen to determine the risk of events while on a waiting list was very large there was a long follow-up. The use of a Swedish source was necessary because of the lack of relevant UK data and the data were validated on the basis of UK patient characteristics. A strong feature of the analysis was the use of a systematic review and meta-analysis to assess the prognostic effect of the strategies and details of the review and meta-analysis were published in a companion paper. QALYs were appropriate as the benefit measure and they allow comparisons with studies conducted in other disease areas. No details of the sources of the utility weights were given, as they were presented in another publication.

Costs:
The categories of costs were relevant to the perspective. Few details of the cost analysis were given, as this information was presented elsewhere. The price year and the discount rate were reported and the cost of the biomarker tests was varied in the sensitivity analysis.
Analysis and results:
The costs and benefits of the various strategies were clearly reported and were synthesised using an incremental approach, which appropriately ruled out the dominated strategies. The investigation of uncertainty was limited to the impact of varying some key inputs to the model. Some aspects of the study were not fully reported as a more detailed description was presented in the other publications.

Concluding remarks:
The study was very well conducted and more details were presented in other publications. The authors’ conclusions were robust.

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Other publications of related interest


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