Cost comparison of four revascularisation procedures for the treatment of multivessel coronary artery disease

Wang X, Rokoss M, Dyub A, Gafni A, Lamy A

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 investigated the costs and clinical events, over a one-year period, for four revascularisation procedures for stable patients with multivessel coronary artery disease. The authors concluded that revascularisation using percutaneous coronary intervention with bare metal stents was the least-costly option for this population. With a few limitations, the study methods and results seem to be appropriate and transparently reported. The authors’ conclusions appear to reflect the evidence available to them.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The aim was to compare four revascularisation procedures for the treatment of multivessel coronary artery disease (MVD) in patients with stable angina.

Interventions
The four revascularisation procedures were: on-pump coronary artery bypass grafting (CABG); off-pump CABG; percutaneous coronary intervention with bare metal stents (BMS); and percutaneous coronary intervention with drug eluting stents (DES).

Location/setting
Canada/secondary care.

Methods
Analytical approach:
A decision analytic model (constructed in DATA 3.5) was employed to enable the synthesis of cost and effect data. The time frame of the analysis was one-year. The authors stated that the study perspective was that of the Canadian health care system.

Effectiveness data:
The effectiveness data were identified by means of literature reviews. Randomised controlled trials (RCTs) and pooled data from RCTs were the preferred sources. The clinical data included rates of death, myocardial infarction, and stroke following each procedure. The methods used to identify and select relevant studies were not stated.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The clinical outcomes (rates of death, myocardial infarction, and stroke) were considered collectively and, although not synthesised with costs, were reported as an overall "event rate”.

Cost data:
The cost types were revascularisation procedures, procedural devices, hospitalisation, adjunctive pharmacological agents, and cardiac-related events. The sources of resource utilisation data were, firstly, the published literature and,
secondly, experts’ opinions. The values came from various sources; case costing, manufacturer prices and national drug formulary. All costs were reported in 2006 Canadian dollars (CAD) and adjusted for inflation using the consumer price index.

Analysis of uncertainty:
One-way sensitivity, scenario and probabilistic sensitivity analyses were performed to assess uncertainty.

Results
One year after the initial procedures, total expected costs were CAD 10,555 for BMS, CAD 13,827 for DES, CAD 13,395 for off-pump CABG, and CAD 15,103 for on-pump CABG. The one-year clinical event rate was 9.8% for BMS and for DES, 9.6% for off-pump CABG and 12.4% for on-pump CABG.

The model was robust to changes in parameter values and BMS remained the least costly option. However, changing the unit cost of DES from CAD 2,000 to CAD 1,800 or increasing the average length of hospitalisation for off-pump CABG to more 9 days, predicted that DES would become the second least-costly procedure after BMS. The results of the probabilistic sensitivity analyses showed that the model was stable. The sensitivity analysis results were clearly presented in tables with 95% confidence intervals.

Authors' conclusions
The authors concluded that revascularisation using percutaneous coronary intervention with BMS was the least-costly option for a population of stable angina patients with MVD. Further analyses would be warranted if better trial or longer-term data became available.

CRD commentary
Interventions:
The interventions were clearly reported and reflected emerging clinical choices for developed countries.

Effectiveness/benefits:
The reporting of the identification and validity of the sources for the clinical effect data was not entirely transparent, although it was stated that the effectiveness data were based on pooled data from four RCTs and two meta-analyses. Although the study primarily focused on the comparative costs between the four strategies, the component clinical event rates (death, myocardial infarction and stroke rates) were reported clearly for each strategy.

Costs:
The types of costs appeared to be appropriate for the perspective taken. The unit costs and sources of the resource types were clearly reported for each of the four strategies. Details on the sources and methods of cost derivation were presented and a price year was given.

Analysis and results:
The costs and clinical outcomes were not synthesised into cost-effectiveness ratios and therefore in effect, a cost-consequences analysis was undertaken. The analyses undertaken were clearly reported and enable the reader to capture the assumptions and the analytical steps taken. The sensitivity analyses were extensive and well-reported for the cost parameters, although no rationale was provided for the choice of distributions (uniform and gamma) for the probability sensitivity analyses. The authors acknowledged a number of limitations relating to resource use and costing uncertainty, and assumptions regarding patient risk profile and reliability of the model estimates. The optimal timing of BMS and issues of generalisability were also discussed.

Concluding remarks:
With a few limitations, the study methods and results seem to be appropriate and transparently reported. The authors’ conclusions appear to reflect the evidence available.

Funding
Not stated.