Economic evaluation of drug-eluting stents: a systematic literature review and model-based cost-utility analysis

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
The study objective was to assess the cost-effectiveness of drug-eluting stents (DES) versus bare metal stents (BMS) in patients undergoing percutaneous coronary intervention. The authors concluded that DES were not likely to represent a cost-effective alternative to BMS in this specific patient population, although they might be cost-effective in patients with a high risk of restenosis. The study was generally well conducted although the derivation of some model inputs was not clear. The authors' conclusions appear valid.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective of the study was to assess the cost-effectiveness of drug-eluting stents (DES) versus bare metal stents (BMS) in patients undergoing percutaneous coronary intervention (PCI). A systematic review of the clinical and economic literature was also carried out.

Interventions
The two interventions under examination were BMS and DES containing an antimitotic agent (sirolimus or paclitaxel).

Location/setting
Finland/hospital.

Methods
Analytical approach:
A simple decision analytic model was developed to compare the two strategies under examination. The time horizon of the analysis was 2 years. The authors did not explicitly state the perspective of the study.

Effectiveness data:
The approach used to derive the clinical data was not reported. In fact, although a systematic review of the literature was conducted to identify studies comparing DES and BMS, the authors did not justify the choice of some specific studies to obtain data for their analysis. The model inputs were mainly derived from a Canadian cost-effectiveness study and a Norwegian study. The former referred to a decision modelling study based on the Quebec administrative database that involved 16,746 PCI cases, while the latter was a modelling analysis referring to approximately 5,000 patients. The key clinical input was the success rate (no need for re-intervention) with DES or BMS.

Monetary benefit and utility valuations:
Utility valuations were derived from a published study, details of which were not given, although utility weights were reported.

Measure of benefit:
The summary benefit measure was the quality-adjusted life-years (QALYs) in the cost-utility analysis and the rate of revascularisations avoided in the cost-effectiveness analysis.

Cost data:
The categories of costs included in the analysis were the health services associated with coronary artery bypass grafting (CABG), BMS and DES. A breakdown of the cost items was not provided. All the costs and quantities were derived from the Cardiac Centre of Tampere University Hospital. The costs were in euros (EUR). The price year was 2006.

Analysis of uncertainty:
Univariate and probabilistic sensitivity analyses were carried out to account for the potential uncertainty associated with the model inputs. Specifically, 10,000 Monte Carlo simulations were performed. Cost-effectiveness acceptability curves were generated.

Results
The expected costs were EUR 4,003.3 with BMS and EUR 4,578.7 with DES (difference EUR 575.3). The expected QALYs were 1.63942 with BMS and 1.64524 with DES (difference 0.00582). The incremental cost per QALY gained with DES over BMS was EUR 98,827.

The cost per avoided revascularisation with DES over BMS was EUR 4,794.

The deterministic sensitivity analysis indicated that the cost-difference between DES and BMS was the key driver of the model. At a threshold of EUR 498 or less, DES was dominant (both more effective and less costly than BMS). Another key driver was the difference in the probability of revascularisation between DES and BMS. If this was assumed to be 0.188 in favour of DES rather than 0.12 in the base-case analysis, the cost per QALY gained would be EUR 30,607, while at a difference of 0.062 the cost per QALY would be EUR 296,712.

The probabilistic sensitivity analysis showed that, even at a threshold of EUR 50,000 per QALY, the probability of DES being acceptable was only 13%. Model findings were sensitive to changes in the rate of revascularisation.

Authors' conclusions
The authors concluded that DES were not likely to represent a cost-effective alternative to BMS in patients undergoing PCI. The systematic review of economic evaluations indicated that the evidence on the cost-effectiveness of DES was inconsistent. The authors stated that more studies should investigate the effectiveness of DES in patients with the highest risk of restenosis, for which it is more likely to be cost-effective.

CRD commentary
Interventions:
The selection of BMS versus DES represents a valid comparison given that they are the two types of stents available for patients undergoing PCI.

Effectiveness/benefits:
The authors undertook a systematic review of clinical and economic studies. Nevertheless, the reasons for the selection of the two key sources of data among the available literature were not stated. Thus, no explicit justification was given for the use of these specific studies. In terms of the quality of the evidence, the authors validated the quality of the two studies using published criteria; this demonstrated the robustness of the sources of clinical data. The use of QALYs as the summary benefit measure was appropriate, not only because they capture the impact of the interventions on all dimensions of health, but also because they are comparable with the benefits of other health programmes.

Costs:
The analysis of the costs was poorly reported. The costs were presented as macro-categories, which were not broken down. Furthermore, the perspective of the analysis was not stated, although it appears that only costs relevant to the health care system were included in the study. The sources of the economic data were not described. However, extensive sensitivity analyses were performed to take account of the variability in cost estimates. The price year was appropriately reported.

Analysis and results:
The synthesis of the costs and benefits was appropriately performed and presented clearly, together with the results of the sensitivity analysis, which satisfactorily addressed the issue of uncertainty. The authors provided an extensive
presentation of the findings from other economic evaluations, the main features of which were described in the appendix.

Concluding remarks:
The study methodology seems valid, especially the appropriate use of sensitivity analysis, despite the limited reporting of the derivation of some model inputs. In general, the authors’ conclusions appear valid.

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Bibliographic details

Other publications of related interest


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