Cost analysis of four major drug-eluting stents in diabetic populations
Saadi R, Cohen S, Banko D, Thompson M, Duong M, Ferko N

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 examined the clinical and economic impact of four drug-eluting stents in diabetic patients and focused on the indirect comparison of the costs of sirolimus-, paclitaxel-, everolimus- and zotarolimus-eluting stents. The authors concluded that sirolimus-eluting stents led to the lowest risk of target lesion revascularisation and saved costs compared with other drug-eluting stents from the perspective of the USA payer. The study used valid and transparent methodology and the authors’ conclusions are robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study examined the clinical and economic impact of four drug-eluting stents in diabetic patients who underwent a percutaneous coronary intervention (PCI). Analysis focused on an indirect comparison of the costs of sirolimus-eluting stents, paclitaxel-eluting stents, everolimus-eluting stents and zotarolimus-eluting stents (zotarolimus-eluting stents).

Interventions
The four drug-eluting stents under examination were sirolimus- (Cypher), paclitaxel- (Taxus), everolimus- (Xience) and zotarolimus-eluting (Endeavor) stents.

Location/setting
USA/hospital.

Methods
Analytical approach:
The analysis was based on a budget impact model with a one-year time horizon. The perspective of the health care payer was adopted.

Effectiveness data:
A review of the literature was undertaken to identify relevant clinical trials on the one-year target lesion revascularisation (TLR) risk, which was a key endpoint of the model. Retrieved studies were combined using an indirect comparison methodology that considered paclitaxel-eluting stents as the common comparator. Meta-analyses of each drug-eluting stent versus paclitaxel-eluting stents were completed using the random-effects model to provide relative risk ratios.

Twelve trials were found: all trials included paclitaxel-eluting stents, seven trials included sirolimus-eluting stents, two trials included zotarolimus-eluting stents and four included everolimus-eluting stents. The pooled population included 4,853 diabetic patients.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
No summary benefit measure was used. Annual TLRs were the main endpoint of the analysis.

Cost data:
The economic analysis included hospital costs associated with index PCI with drug-eluting stents, re-interventions, PCI with stent, PCI with drug-eluting stents, PCI with bare metal stents, PCI without stent and coronary artery bypass grafting (CABG). No cost differences were considered for the various drug-eluting stents. Prevalence of PCI was taken from a Canadian observational study. All costs were based on reimbursement rates for Medicare Severity Adjusted Diagnosis Related Groups. Costs were in USA dollars ($).

Analysis of uncertainty:
Two different methodologies were used for estimating TLR risk. In method one the exact point estimate relative risk (regardless of statistical significance) was multiplied by the weighted average TLR risk for paclitaxel-eluting stents. Method two multiplied a relative risk of 1.0 if meta-analyses showed non-significant results.

In one-way sensitivity analyses, the upper and lower relative risk confidence intervals for drug-eluting stents were multiplied by the weighted average TLR risk for paclitaxel-eluting stents. Another sensitivity analysis considered only studies that measured clinically-driven TLR when calculating the baseline weighted average TLR risk for paclitaxel-eluting stents.

Results
The one-year TLR was 3.2% with sirolimus-eluting stents, 6.9% with paclitaxel-eluting stents, 7.1% with zotarolimus-eluting stents and 7.9% with everolimus-eluting stents.

Using method one (different TLR risk for each drug-eluting stents) in a hypothetical cohort of 200,000 patients, predicted annual TLRs were 6,376 with sirolimus-eluting stents, 14,278 with zotarolimus-eluting stents, 13,862 with paclitaxel-eluting stents and 15,940 with everolimus-eluting stents. The corresponding population budget impact and per patient budget impact for the four drug-eluting stents were $3.62 billion and $18,125 with sirolimus-eluting stents, $3.78 billion and $18,899 with zotarolimus-eluting stents, $3.77 billion and $18,858 with paclitaxel-eluting stents and $3.81 billion and $19,060 with everolimus-eluting stents.

Sirolimus-eluting stents resulted in lower risk of TLR and were less costly than the other options. Sirolimus-eluting stents were the preferred intervention even when conservative assumptions were made (method two). This conclusion was further confirmed in the sensitivity analyses.

Authors' conclusions
The authors concluded that sirolimus-eluting stents not only led to the lowest risk of TLR but also saved costs compared with other available drug-eluting stents from the perspective of the USA payer.

CRD commentary
Interventions:
The rationale for selection of the comparators was clear as the four commercially available drug-eluting stents in the USA were considered.

Effectiveness/benefits:
The clinical side of the study was performed satisfactorily. An extensive review of the literature was undertaken to identify relevant sources of evidence. Clinical trials are considered to be valid sources of clinical inputs due to the methodological rigour of the study design. A large sample size of patients was available from these trials. Appropriate statistical methods were used to pool evidence based on an indirect comparison using a common comparator. Use of alternative methodologies was considered. It appeared that the clinical endpoints were estimated from the best available sources. The main endpoint was the risk of TLR, which represented a direct outcome of PCIs. This disease-specific measure might not be comparable with the benefits of other health care interventions.

Costs:
The categories of costs included and the sources used reflected the perspective of the healthcare payer, as stated by the authors. Costs were presented as macro-categories. Stent costs were not included as these were not required in the authors’ setting. Costs were treated deterministically and were not varied in the sensitivity analysis. The authors stated that the analysis focused on costs of procedures and that other costs (such as those associated with stent thrombosis) were not considered as they were rare events. The price year was reported implicitly.
Analysis and results:
The study results were presented extensively. Total and incremental findings were reported but costs and benefits were not combined into a cost-effectiveness ratio as a cost-consequences analysis was carried out. The issue of uncertainty was partially investigated by changing key assumptions of the model. The authors stated that their results might be relevant in a European setting as differences among stents were mostly based on clinical findings that came from several trials conducted outside USA. Stent prices might be relevant in other settings.

Concluding remarks:
The study used valid and transparent methodology and the authors’ conclusions are robust.

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