Cost effectiveness of drug-eluting stents in acute myocardial infarction patients in Germany: results from administrative data using a propensity score-matching approach

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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 drug-eluting stents versus bare-metal stents for patients with acute myocardial infarction using administrative data from a large database. The authors concluded that bare-metal stents were more cost-effective than drug-eluting stents from the perspective of the German health care payer. Drug-eluting stents may be cost-effective in specific patient subgroups. The study used a transparent and valid methodology that was presented in detail. The authors’ conclusions appear robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The study examined the cost-effectiveness of drug-eluting stents versus bare-metal stents as routine treatment for patients with acute myocardial infarction using administrative data from a large database.

Interventions
The interventions under examination were bare-metal stents and drug-eluting stents (containing sirolimus or paclitaxel).

Location/setting
Germany/hospital.

Methods
Analytical approach:
The analysis was based on a hospital database with a one-year time horizon. The authors stated that the analysis took the perspective of the health care payer.

Effectiveness data:
All data were taken from a large German sickness fund (Techniker Krankenkasse) that reported medical charts of patients who had suffered an acute myocardial infarction and had been followed up for one year after hospital discharge in 2004 and 2005. Inclusion/exclusion criteria were reported. The analysis focused on the use of a specific propensity score-matching procedure to take account of the potential impact of clinical and socio-demographic factors on the efficacy of the interventions. The whole study sample included 5,457 patients; 732 patients were treated with drug-eluting stents (mean age 60.7 years; 13.80% female) and 4,725 patients were treated with bare-metal stents (mean age 62.2 years; 13.93% female). The propensity score-matching procedure matched 719 patients in both groups. The primary endpoint was 365-day survival after discharge from index admission.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
The summary benefit measure was the survival rate after one year.

Cost data:
The costs included all hospital-associated costs for the interventions, including both the index admission and subsequent hospitalisations. All economic data were taken from the administrative database used in the clinic. Propensity score-matching procedure was used to match the two patient groups taking into account baseline differences. Costs were in Euros (EUR). The price year was 2005.

Analysis of uncertainty:
A bootstrapping approach was used to construct confidence intervals around incremental cost-effectiveness ratio. Alternative assumptions for the propensity score matching procedure were taken into account in the sensitivity analyses. In a subgroup analysis, patients with ST elevation myocardial infarction (STEMI) were separated from those with non-ST elevation myocardial infarction.

Results
Expected one-year costs were EUR 11,714 ± EUR 9,967 with bare-metal stents and EUR 12,713 ± EUR 10,753 with drug-eluting stents. The additional cost with drug-eluting stents was EUR 1,000 (95% CI –24 to 2,044).

The one-year survival rate was 97.50% in the bare-metal stent group and 97.36% in the drug-eluting stent group. The incremental 365-day survival of the drug-eluting stent group compared with the bare-metal stent group was -0.14% (95% CI –1.95% to 1.39%).

Under base case conditions, bare-metal stents were the dominant strategy as they were slightly more effective and cheaper than drug-eluting stents.

The bootstrapping analysis showed that drug-eluting stents were dominant in 2.7% of replications, while drug-eluting stents dominated in 54.4% of iterations.

Results were generally robust, as shown in the sensitivity analyses. Only in the subgroup of non-ST elevation myocardial infarction patients, were drug-eluting stents associated with a significant improvement in one-year survival, resulting in an incremental cost-effectiveness ratio of EUR 36,563 per life saved with drug-eluting stents over bare-metal stents.

Authors' conclusions
The authors concluded that bare-metal stents were more cost-effective than drug-eluting stents for the treatment of patients with acute myocardial infarction from the perspective of the German health care payer. Drug-eluting stents may be cost-effective in specific patient subgroups.

CRD commentary
Interventions:
The selection of the comparators was appropriate as the two available treatments for this patient population were considered.

Effectiveness/benefits:
The clinical analysis was based on evidence from an administrative database. The authors pointed out the advantages and disadvantages of using such a source of evidence: the advantage was that it reflected real-world pattern of care and the effectiveness of the two procedures; the disadvantage was that it might have introduced some selection bias. In effect, some key differences in the baseline characteristics of the two patient groups were observed. Given these issues, the propensity score-matching procedure was used to take into account differences in patient groups. The final analysis showed that only a small number of variables were significantly different. Details of the two patient groups were clearly reported and appropriate methods were used to perform the clinical analysis, whose results appeared valid. Alternative regression techniques were also used.

The survival rate was used as the summary benefit measure as it represented the immediate and most relevant outcome of the treatments under examination.

Costs:
The included cost categories were those that related to the hospitalisation, which is reimbursed by the third-party payer.
using Diagnosis Related Groups. Quantities of resources used were taken from the same database used for clinical data. The same statistical approach was used to deal with potential differences among groups. The costs reflect the German setting. The price year was reported, which would allow reflation exercises. Costs were treated stochastically and confidence intervals around mean costs were reported.

Analysis and results:
The authors reported clearly the methodological details of the propensity score-matching procedure; they pointed out that the use of this specific approach should have overcome the limitations associated with the use of an administrative database, which could entail some degree of patient selection bias due to the lack of a random assignation procedure. The propensity score-matching was used to perform a quasi-randomisation of patients. Uncertainty was partially investigated using various statistical approaches and some alternative scenarios. The study results were clearly reported. All the findings from the various analytic approaches were discussed. The authors reported results from other published studies to highlight differences between economic evaluations based on randomised controlled trials and those based on real-world data. Study findings should be considered specific to Germany and could not be directly applied to other countries.

Concluding remarks:
The study used a transparent and valid methodology that was presented in detail. The authors’ conclusions appear robust.

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