Acute and long-term cost implications of coronary stenting


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.

Health technology
Use of a coronary stent in association with ticlopidine/aspirin therapy in patients undergoing percutaneous coronary intervention.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients undergoing percutaneous coronary intervention. Patients were excluded if at baseline: (1) the procedure involved laser, rotational or directional atherectomy or TEC devices; (2) a non-Palmaz-Schatz coronary stent was implanted; (3) the left main or a saphenous vein graft was revascularised; (4) acute myocardial infarction (MI) occurred within two days preceding the procedure; (5) the revascularisation was part of a staged series of interventional procedures; (6) an emergency bypass surgery immediately followed the procedure; or In addition to the exclusion criteria listed above, patients with a target vessel diameter (as assessed by the largest balloon size) of less than 2.7 mm in diameter, were excluded from the coronary angioplasty group.

Setting
Contemporary clinical practice. The economic study was carried out in Durham, North Carolina, USA.

Dates to which data relate
Effectiveness and resource use data were collected between 1 September 1995 and 30 June 1996. The price year was 1996.

Source of effectiveness data
Effectiveness data were derived from a single study.

Link between effectiveness and cost data
Costing was retrospectively performed on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations were not used to determine the sample size. The study sample consisted of 384 stent patients with an average age of 60 years and 159 coronary angioplasty (PTCA) patients with a mean age of 62 years. The study samples were selected from a group of 1,039 patients (530 in the PTCA group and 509 in the stent group).
Study design
This was a cohort study, carried out in a single centre. The duration of the follow-up was 1 year. No loss to follow-up was reported. The classification of follow-up hospital admissions into cardiac and non-cardiac indications was carried out by investigators blinded to treatment status.

Analysis of effectiveness
The analysis of effectiveness was based on treatment completers only. The clinical outcome measures were 1-year event rates including readmission, cardiac catheterisation, any repeat revascularisation, death, myocardial infarction, any angina, and work status (percentage in employment). The two study groups were found to be generally similar in terms of demographic features. The groups were found to be different in terms of prior procedures, location of intervention, and multivessel coronary intervention. Logistic regression analysis was used to adjust for the effects of potential confounding clinical risk factors on the probability of readmission.

Effectiveness results
The 1-year readmission rate was 29% for the stent group versus 42% in the PTCA group, (p=0.006). The corresponding rates in terms of cardiac catheterisation were 27% and 43%, (p=0.001). The stent group had a 14% 1-year rate of any repeat revascularisation versus 30% in the PTCA group, (p=0.001). Death during follow-up was 3% in both groups. The 1-year myocardial infarction rate was 2% for the stent group versus 5% in the PTCA group, (p=0.004). The corresponding rates with respect to any angina were 23% and 29%, (p=0.14). The employment rate was 75% for the stent group versus 63% in the PTCA group, (p=0.06).

Clinical conclusions
The clinical benefits of coronary stenting (in terms of decreasing repeat interventions) found in early randomised trials appear to be mirrored in this observational cohort. The results support the generalisation of the findings from more selective populations in randomised trials.

Measure of benefits used in the economic analysis
No summary benefit measure was explicitly identified in the economic analysis, and only separate clinical outcomes were reported. As such the study may be regarded as a cost-consequences analysis.

Direct costs
Costs were not discounted despite the 1-year follow-up period adopted in the study. Quantities were reported separately from the costs. Costs were broken down. Cost analysis covered the baseline and follow-up costs of hospitalisations, inpatient professional fees, and outpatient catheterisation (including professional fees). The perspective adopted in the cost analysis was that of the hospital and society. The source of resource use data for index hospitalisation was the local information system and a supplementary laboratory database, while the source of follow-up resource use data was telephone interviews conducted at 6 and 12 months after the procedures were performed. These were confirmed by data from the hospital, and supplemented by data from a local database. The source of cost data was a local transition 1 accounting system. The charge data were the source of cost data for resource use in other hospitals (rather than the study hospital); standard department-level cost-to-charge methodology was used to estimate costs from charge data. 1996 price data were used. Costs for cardiac medications or office visits were not included in the cost calculations. A set of estimations were performed to calculate the risk-adjusted one-year cumulative costs for three clinical scenarios:

1. a 60-year old patient without comorbid illness,
2. 60-year old patient with diabetes mellitus, and
3. 60-year old patient with multiple comorbid illnesses.
Statistical analysis of costs
Student’s t test was used to compare the study groups in terms of cumulative costs after log transformation. Adjustments were made for the effects of potential confounding clinical risk factors on the costs using multiple regression analysis. The risk-adjusted cumulative costs at one year were estimated using Monte Carlo analysis.

Indirect Costs
Not considered.

Currency
US dollars ($).

Sensitivity analysis
One-way sensitivity analyses were performed by excluding follow-up revascularisations in vessels other than the baseline target vessel and patients with prior coronary revascularisation procedures.

Estimated benefits used in the economic analysis
Not applicable.

Cost results
The average total cost was $22,140 in the stent group versus $22,571 in the PTCA group, (p=0.26). The respective estimated mean cumulative costs for patients without comorbid illness were $20,336 compared to $20,320. The corresponding values for patients with diabetes were $21,300 and $22,700.

Synthesis of costs and benefits
Costs and benefits were not combined since the use of a coronary stent was regarded as the dominant strategy (with better effectiveness results and similar costs). It was reported that the sensitivity analysis did not change the overall results.

Authors' conclusions
In contemporary practice, coronary stenting provides equivalent or better one-year patient outcomes without increasing cumulative health care costs.

CRD COMMENTARY - Selection of comparators
A justification was provided for the choice of the comparator, which was a conventional health technology in the context in question. You, as a database user, should consider whether this is a widely used health technology in your own setting.

Validity of estimate of measure of benefit
The internal validity of the estimates of effectiveness cannot be guaranteed due to the inherent limitations of the observational design adopted in the study (as acknowledged by the authors). The study should be regarded as a cost-consequences analysis.

Validity of estimate of costs
Good points of the analysis were that quantities were reported separately from the costs and adequate details of the methods of cost estimation were given. The effects of different health modalities on indirect costs (lost production)
were not evaluated.

**Other issues**
The authors’ conclusion seems to be justified. As the authors acknowledge, however, the results may not be generalisable to other settings. Appropriate comparisons with other studies were made.

**Implications of the study**
The results of the study suggest that the acute expense associated with implantation can be largely offset within six months by a reduction in the need for repeat interventions.

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