Resource utilization for minimally invasive direct and standard coronary artery bypass grafting


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
Minimally invasive direct coronary artery bypass grafting (MIDCABG) for selective patients with coronary artery disease (CAD).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients selected to undergo MIDCABG had to fulfil two sets of characteristics: (1) having single-vessel coronary artery disease with anticipated complete revascularisation by MIDCABG; (2) having double- or triple-vessel coronary artery disease and exceedingly high risk for postoperative morbidity with conventional CABG. Candidates who underwent CABG were a group of patients with left ventricular ejection fraction greater than 0.50. Redo cases and patients with concomitant procedures associated with CABG were excluded.

Setting
Hospital. The economic study was carried out in Pittsburgh, Pennsylvania, USA.

Dates to which data relate
The resource use and effectiveness data were collected between January and August 1996. The price year was not clearly reported.

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

Link between effectiveness and cost data
The costing was undertaken on the same patient sample as that used in the effectiveness analysis, although it was not explicitly specified whether it was undertaken prospectively or retrospectively.

Study sample
Power calculations were not used to determine the sample size. A total of 50 patients was included in the study: 17 in the intervention group (MIDCABG group) with a mean (SD) age of 64 (12) years, and 33 in the control group (CABG group) with a mean (SD) age of 65 (11) years. The patients in the CABG group were selected from a total of 510
patients entered in the Society of Thoracic Surgeons' database.

**Study design**
This was a cohort study (it was not clear whether the study was prospective or retrospective). The intervention was carried out in a single centre, whereas the control group consisted of patients included in a database covering several institutions. The individuals were followed up until hospital discharge. Loss to follow-up was not reported.

**Analysis of effectiveness**
It was not made clear by the authors whether the analysis was based on the intention to treat principle. The primary health outcomes used in the analysis were the rate of complications associated with each strategy and the rate of incomplete revascularisations. The groups were shown to be comparable in terms of age, sex, history of previous percutaneous transluminal coronary angioplasty, left ventricular ejection fraction, unstable angina, diabetes, hypertension, history of myocardial infarction, congestive heart failure, patients with problems of obesity, incomplete revascularisation, intraaortic balloon pump, creatinine level above 2.0 mg/dL, and predicted risk of mortality. The only difference turned out to be related to the higher number of patients with two or three-vessel CAD in the control group.

**Effectiveness results**
One complication (atrial fibrillation) was observed in the intervention group (6%), and 15(45%) occurred in the control group. There was a 6% incidence of stroke, 27% incidence of atrial fibrillation, 6% incidence of leg wound infection, and 6% incidence of prolonged ventilatory support. Significantly less morbidity was observed in the MIDCABG group compared with CABG. No blood transfusion was required in the MIDCABG group versus 14 patients (42%) in the CABG group, (p<0.0001). The rate of incomplete revascularisation was 47% (MIDCABG) and 21% (CABG), (p>0.05).

**Clinical conclusions**
When CABG was compared with MIDCABG, it was found, in these observational series, that MIDCABG was associated with significantly reduced hospital resource utilization and morbidity.

**Measure of benefits used in the economic analysis**
No summary benefit measure was identified.

**Direct costs**
Costs were not discounted since the cost analysis included those costs generated from the day of operation to the day of hospital discharge. Some quantities were reported separately from costs. Cost analysis covered the costs of the operating room, perfusion, anaesthesia, ICU, ICU labs, room, blood bank, laboratory, pharmacy, and respiratory therapy. The cost data were originally obtained as charges, and were subsequently transformed to cost figures by applying cost-to-charge ratios for each department of the hospital. These data corresponded to the period between January and August 1996. The costs associated with pre-operation work-up and cardiology diagnosis were not included in the analysis nor were the costs associated with professional fees, which were reported as having been common to both strategies.

**Statistical analysis of costs**
Student's t test was used to compare the study groups in terms of cost components and total cost.

**Indirect Costs**
Not considered.
Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was performed.

Estimated benefits used in the economic analysis
The reader is referred to the “effectiveness results” section of this abstract.

Cost results
The mean (SD) total costs were $12,885 ($1,511) for the intervention (MIDCABG) and $21,260 ($5,497) for the control (CABG). Thus, the intervention resulted in an average saving of $8,375, (p<0.0001).

Synthesis of costs and benefits
The costs and benefits were not combined since the intervention was shown to be the dominant strategy.

Authors’ conclusions
Minimally invasive CABG is associated with a significant reduction in resource utilization and morbidity related to initial hospitalisation compared with CABG.

CRD COMMENTARY - Selection of comparators
The comparator used (CABG) was the standard treatment option for selected patients with coronary artery disease (CAD).

Validity of estimate of measure of benefit
The internal validity of the study results cannot be guaranteed due to the small sample size and short follow-up period.

Validity of estimate of costs
Some quantities of resource use were reported separately from the costs and adequate details of the methods of cost estimation were given. The limited study period excluded those costs associated with the follow-up period. Cost results may not be generalisable to other settings or countries.

Other issues
It was reported that the study results were unlikely to be generalisable, given that the cost data included those costs associated with residency training and research and thus, may not correspond to the context prevailing in other for-profit hospitals in the USA. Appropriate comparisons were made with other studies. The results were not presented selectively.

Implications of the study
The authors planned to continue to follow-up the two groups of patients and evaluate the follow-up costs. However, they did not anticipate significant difference in these long-term costs because the anastomotic patency of the LIMA anastomosis was verified in the operating room for all MIDCABG patients and because there was no significant difference in the number of patients with incomplete revascularisation in either MIDCABG or CABG groups.
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