Off-pump coronary artery bypass grafting in patients with end-stage renal disease on hemodialysis

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
Off-pump coronary artery bypass grafting (CABG) for haemodialysis patients was compared with on-pump CABG.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised adult haemodialysis patients with end-stage renal disease, who entered the Fukuoka University Hospital and who were eligible for a CABG.

Setting
The setting was secondary care. The economic study was carried out at Fukuoka University Hospital, Fukuoka, Japan.

Dates to which data relate
The effectiveness evidence came from April 1994 to December 2000. The price year was not reported.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing was carried out retrospectively using the same patient sample as that used in the effectiveness study.

Study sample
The authors provided no indication that a sample size was planned and no power calculations were reported. Among 598 CABGs performed between April 1994 and December 2000 at Fukuoka University Hospital, 26 patients with end-stage renal disease who were on haemodialysis were identified. There were 15 patients in the off-pump group and 11 in the on-pump group (control). No further details of the eligibility criteria or sample selection process were stated. No patient exclusions were stated.

Study design
This was a retrospective study that was conducted in a single centre. The median duration of follow-up was 46 months.
for the on-pump group and 18 months for the off-pump group. No loss to follow-up was reported.

**Analysis of effectiveness**
All of the patients entered into the study were included in the analysis. The primary outcome variables used were:

- death,
- perioperative myocardial infarction,
- postoperative intra-aortic balloon pumping,
- atrial fibrillation,
- sternal wound infection,
- reoperation for bleeding,
- blood transfusion,
- average blood transfusion,
- intubation time,
- the length of stay in the intensive care unit (ICU), and
- postoperative hospital stay.

In addition, the overall survival rates at 1 and 2 years, and the cardiac death-free survival rate were reported. Survival curves were estimated using the Kaplan-Meier method. The authors reported that the differences in the characteristics of the groups (e.g. female gender, age, diabetes, carotid artery stenosis, duration of dialysis, prior infarction) were non significant, but no p-values were reported. No adjustments for possible confounding factors were reported.

**Effectiveness results**
The average blood transfusion was 2.5 (standard deviation, SD=2.1) for the off-pump group and 8.3 (SD=2.8) for the on-pump group, (p<0.0001).

The intubation time was 8.5 hours (SD=5.8) for the off-pump and 26.1 hours (SD=13.0) for the on-pump group, (p=0.001).

The length of stay in the ICU was 1.7 days (SD= 0.7) for the off-pump group and 3.5 days (SD=1.9) for the on-pump group, (p=0.01).

The hospitalisation death rate and perioperative myocardial infarction rate were 0 for both groups.

The overall survival rate at 1 year was 81.8% for the on-pump group and 85.7% for the off-pump group, (p non significant).

The overall survival rate at 2 years was 81.8% for the on-pump group and 68.6% for the off-pump group, (p non significant).

The cardiac death-free survival rates at 1 or 2 years were 85.7% (on-pump) and 100% (off-pump), respectively, (p non significant).

**Clinical conclusions**
Off-pump CABG provided excellent less-invasive cardiac surgical results for dialysis patients.

**Measure of benefits used in the economic analysis**
No summary measure of health benefit was used in the economic analysis and the clinical outcomes were left disaggregated. A cost-consequences analysis was therefore performed.

**Direct costs**
The hospital costs (including surgery and ICU) from the time of admission to discharge were reported. The costs seem to have been estimated from actual data. The quantities and the costs were not reported separately. No further details of the cost calculations or discounting were reported. The price year was not reported.

**Statistical analysis of costs**
The costs were treated stochastically. The Mann-Whitney U-test seems to have been used.

**Indirect Costs**
No indirect costs were reported.

**Currency**
The currency was not explicitly reported, but it appears to have been US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was reported.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The hospital cost (including surgery and ICU) from the time of admission to discharge was $26,200.8 (SD=10,417.7) for the off-pump group and $44,024.1 (SD=9,012.0) for the on-pump group, (p=0.0001).

No discounted costs, currency conversions or incremental costs were reported. No further details were reported in the paper.

**Synthesis of costs and benefits**
Not applicable.

**Authors' conclusions**
The in-hospital medical costs were significantly smaller in the off-pump group than in the on-pump group. Compared with on-pump coronary artery bypass graft (CABG), operative morbidity, postoperative length of stay, perioperative blood usage and in-hospital medical costs were improved by the use of the off-pump method in this patient population. The authors concluded that off-pump CABG is a safe and effective method of myocardial revascularisation in haemodialysis patients.

**CRD COMMENTARY - Selection of comparators**
The authors explicitly stated the comparator health technology (on-pump CABG). Although no explicit justification was given for the comparator used, it would appear to have represented current practice in the authors’ setting. You should decide if the comparator represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on a retrospective comparison of the two groups (on-pump and off-pump CABG), which was not appropriate for the study question. The study sample was appropriate since it consisted of patients on haemodialysis who underwent two different types of CABG. However, the study sample was very small, which makes it hard to determine whether the sample was representative of the population and to find statistical differences. There were no statistically significant differences in preoperative characteristics between the study groups. Given the study design, bias in this study is likely to be high and the internal validity may be quite low.

Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefit. The study was therefore categorised as cost-consequences analysis.

Validity of estimate of costs
All the categories of costs relevant to the perspective appear to have been included (hospital costs, including surgery and ICU, from the time of admission to discharge). However, no further details of the cost calculations were reported. The quantities and the costs were not reported separately. Details of discounting and the price year were not reported. Moreover, uncertainty in the cost results was not investigated. Hence, the reproducibility of the results obtained is very limited.

Other issues
The authors did not make appropriate comparisons of their findings with those of other studies. In addition, the issue of the generalisability to other settings was not addressed. The authors did not present their results selectively. The authors did not report any major limitations of their study. Although the authors recommended off-pump CABG for coronary revascularisation on haemodialysis patients, this conclusion should be treated with caution given the fact that the study design did not adjust for possible confounding or bias.

Implications of the study
The authors recommended off-pump CABG for coronary revascularisation in haemodialysis patients.

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None stated.

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Other publications of related interest
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