**Leukocyte-reduced transfusions in cardiac surgery: results of an implementation trial**


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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.

**Health technology**
The use of filtered leukocyte transfusion in cardiac surgery. This was compared with a historical control group receiving allogeneic transfusions.

**Type of intervention**
Treatment.

**Economic study type**
Cost-effectiveness analysis.

**Study population**
The study population comprised adult patients who were undergoing primary coronary artery bypass grafting and/or primary valve replacement. Two surgeons performed all the operations. Patients were not included in the study if they had undergone repeat operations or other types of cardiac or vascular surgery, if they had had surgery performed by another surgeon, or were children. No further details of the study population were provided.

**Setting**
The setting was secondary care. The economic study was carried out in New York, USA.

**Dates to which data relate**
The data were compiled from Cardiothoracic Division records, the transfusion service, the hospital finance office, a laboratory information system and written medical records. The effectiveness data were collected from July to December 1997 for the control group and from July to December 1998 for the intervention group. The cost data were obtained from the hospital finance department. These appear to have been collected at the same time as the effectiveness data.

**Source of effectiveness data**
The effectiveness data were derived from a single study.

**Link between effectiveness and cost data**
It appears that costing has been undertaken prospectively on the same patient sample as that used in the effectiveness study.

**Study sample**
The sample size was not determined in the planning stage of the study. Details of the sample selection process were not given, although the authors stated that the analysis included approximately 50% of the 650 patients who underwent...
open-heart surgery during the study period. The authors did not provide details of patients who refused to participate in the study, or were excluded. However, the authors stated that 12 patients in 1997 and 11 in 1998 were excluded from the analysis because they had received intraoperative salvage. There appear to have been 386 patients starting the trial, of which 204 were in the historical control group and 182 in the intervention group.

**Study design**
This was a comparative study with historical controls that was carried out in a single centre. The data were collected for 6 months (July to December 1997 for the controls and July to December 1998 for the intervention group). The loss to follow-up was not reported.

**Analysis of effectiveness**
The primary health outcomes used were:

- the number of hours in intensive care,
- the number of hours of ventilator use,
- the number of days of antibiotic therapy,
- the number of days with fever, and
- the number of deaths during hospitalisation.

The study did not specify which (if any) instruments were used to evaluate the data. It appears that all the patients included in the study have been accounted for in the analysis. The groups were comparable at baseline.

**Effectiveness results**
For transfusion recipients in the 1997 cohort, the length of stay (LOS) was 15.1 (standard deviation, SD=22.1) days. These patients spent 118 (SD=385) hours in the intensive care unit (ICU) and 80 (SD=35) hours on ventilation. They also had 6.7 (SD=22) days of antibiotic therapy and spent 6.9 (SD=11) days with fever. During hospitalisation, 5.3% of these patients died.

For transfusion recipients in the 1998 cohort, the LOS was 12.4 (SD=12.6) days. These patients spent 81 (SD=162) hours in the ICU and 33 (SD=120) hours on ventilation. They had also 4.6 (SD=10) days of antibiotic therapy and spent 5.4 (SD=6) days with fever. During hospitalisation, 3.2% of these patients died.

For patients in the 1997 cohort who did not receive transfusion, the LOS was 6.2 (SD=2.8) days. These patients spent 22 (SD=6.4) hours in the ICU and 7.0 (SD=4.6) hours on ventilation. They also had 0.24 (SD=1.0) days of antibiotic therapy and spent 2.5 (SD=1.7) days with fever. No patients died in hospital.

For patients in the 1998 cohort who did not receive transfusion, the LOS was 5.7 (SD=2.0) days. These patients spent 22 (SD=7.1) hours in the ICU and 4.2 (SD=2.0) hours on ventilation. They also had 0.32 (SD=1.5) days of antibiotic therapy and spent 3.3 (SD=1.5) days with fever. No patients died in hospital.

**Clinical conclusions**
The implementation of leukocyte reduction for all transfusion patients undergoing cardiac surgery resulted in reductions in the LOS, hours in intensive care, ventilator use, antibiotic therapy, fever and deaths during hospitalisation.

**Measure of benefits used in the economic analysis**
The authors did not derive a summary measure of benefit. In effect, a cost-consequences analysis was performed.
Direct costs
The total charges and costs from the perspective of the hospital were reported. The costs were estimated from detailed accounting by the hospital finance department, which included actual variable expenses, exclusive of overheads that occurred for all the study patients. Resource use and the unit costs were not reported separately. Discounting was not relevant because the time horizon of the study was less than 2 years, and was not undertaken. The historical control data for the intervention group related to 1997 and 1998. The price years were 1997 and 1998 (no correction for inflation was carried out).

Statistical analysis of costs
Descriptive statistics were given in the form of SDs.

Indirect Costs
No indirect costs were included in the analysis.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was carried out.

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

Cost results
For the transfusion recipients in the 1997 cohort, the total charges were $46,000 (SD=56,800) and the total costs were $29,000 (SD=36,300).

For the transfusion recipients in the 1998 cohort, the total charges were $40,900 (SD=39,300) and the total costs were $28,200 (SD=25,100).

For the patients in the 1997 cohort who did not receive transfusion, the total charges were $22,500 (SD=2,500) and the total costs were $14,800 (SD=3,800).

For the patients in the 1998 cohort who did not receive transfusion, the total charges were $22,400 (SD=10,600) and the total costs were $18,800 (SD=10,800).

Synthesis of costs and benefits
The costs and benefits were not combined.

Authors' conclusions
Leukocyte-reduced transfusions in cardiac surgery are associated with decreased costs of care, and may also reduce mortality.

CRD COMMENTARY - Selection of comparators
Although no explicit justification was given for the comparator used, it would appear to represent current practice. 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 comparative study with historical controls. This can often lead to biases if other conditions have changed over that period (e.g. drug treatments, surgery skills, hospital equipment). However, because the two time periods were reasonably close, there is good reason to consider the comparisons to be valid. The study sample was representative of the intervention's target group. The patient groups were shown to be comparable at analysis.

Validity of estimate of measure of benefit
The authors did not provide a summary measure of health benefit. To allow meaningful comparisons with cost-effectiveness analyses in other disease areas, it would have been useful to have used a benefit measure such as quality-adjusted life-years.

Validity of estimate of costs
All the categories of costs relevant to the perspective adopted were included in the analysis. The costs and the quantities were not reported separately. A statistical analysis of the quantities was reported, but there was no statistical analysis of the prices.

Other issues
The authors made appropriate comparisons of their findings with those from other studies and the issue of generalisability was addressed. The authors commented that, as the study was not a randomised trial, it cannot be assumed that all hospitals implementing the intervention would experience similar results. The authors do not appear to have presented their results selectively. The authors’ conclusions were based on the study sample (i.e. adults) and, therefore, these conclusions should apply to adult patients only.

The authors reported a number of further limitations to their study. For example, the study design did not allow the issue of potential bias or confounding to be completely addressed. The authors commented that this prevents conclusive evidence being drawn about causality or the scientific validity of the study.

Implications of the study
The study results implied that the use of leukocyte-reduced transfusions is likely to reduce treatment costs and mortality rates.

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None stated.

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