The role of autologous blood transfusion in joint replacement surgery

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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
Using predeposited autologous blood transfusion (PABT) with and without intra/postoperative blood salvage (ABS) in order to lower or eradicate the use of homologous blood transfusion (HBT) in patients undergoing joint replacement surgery (primary total hip or knee replacement surgery).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients undergoing primary joint replacement surgery.

Setting
Hospital. The economic study was performed in Adelaide, South Australia.

Dates to which data relate
Effectiveness data related to the retrospective study were collected between 1986 and 1990. The date for the effectiveness data in the prospective study collected was not specified. Resource use (with the exception of the number of units of blood transfusion) was not systematically reported. The fiscal year was not clearly specified.

Source of effectiveness data
Effectiveness data were derived from two studies, one prospective and one retrospective, performed by the authors.

Link between effectiveness and cost data
It was not specified on which patient sample (the prospective or the retrospective one) the costing was undertaken.

Study sample
Power calculations were not used to determine the sample size. In the retrospective study, the hospital records of 618 patients (317 undergoing primary total knee replacements and 301 consecutive patients undergoing primary total hip replacements) with a median age of 73 years (range: 43 - 96 years) were evaluated. The study sample in the prospective study constituted of 44 and 62 patients in the cemented and uncemented total hip replacement (THR) groups respectively, and 99 patients in the total knee replacement (TKR) group. The median age in the prospective study sample varied from 71 to 75 years (range: 42 - 93 years). In the prospective study, the 106 patients in total hip replacement arm were randomly allocated to either ABS group (47 subjects) or no-ABS group (59 subjects) using a
computer-generated randomised table. The 99 patients in the total knee replacement arm were also randomly assigned to either ABS group (44 subjects) or no-ABS group (55 subjects).

**Study design**
The studies were a prospective randomised trial (ABS and no-ABS groups) and a retrospective cohort study, performed in a single centre. The duration of the follow-up was up to 48 hours after surgery. No loss to follow up was reported.

**Analysis of effectiveness**
The principle (intention to treat or treatment completers only) used in the analysis of effectiveness was not explicitly specified. The percentage of patients needing HBT was the main health outcome measure in both prospective and retrospective studies. In the retrospective study, a subgroup of 64 patients (32 with ABS and 32 without ABS) were matched in terms of age, sex, and type of surgery. In the prospective study, it was stated that the groups were comparable in terms of preoperative and postoperative haemoglobin levels.

**Effectiveness results**
The percentage of patients needing homologous blood transfusion (HBT) in the retrospective study were 100% for no-PABT, 41% for PABT, 63% for ABS and 22% for PABT+ABS. In the prospective study, the percentage of patients with no PABT needing HBT, reduced from 100% for cemented-THR patients with no-ABS to 89% for the same group of patients with ABS, (p<0.005). The percentage of patients with 1-2 units PABT needing HBT, reduced from 50% for cemented-THR patients with no-ABS to 29% for the same group of patients with ABS, (p<0.005). The percentage of patients with 3 units PABT needing HBT, reduced from 38% for cemented-THR patients with no-ABS to 0% for the same group of patients with ABS, (p<0.005). The percentage of patients with no PABT needing HBT, reduced from 83% for uncemented-THR patients with no-ABS to 70% for the same group of patients with ABS, (p<0.001). The percentage of patients with 1-2 units PABT needing HBT, reduced from 58% for uncemented-THR patients with no-ABS to 57% for the same group of patients with ABS. The percentage of patients with 3 units PABT needing HBT, reduced from 25% for uncemented-THR patients with no-ABS to 0% for the same group of patients with ABS, (p<0.001). The percentage of patients with no PABT needing HBT, reduced from 79% for the TKR patients with no-ABS to 50% for the same group of patients with ABS. The percentage of patients with 1-2 units PABT needing HBT, reduced from 22% for the TKR patients with no-ABS to 0% for the same group of patients with ABS. The percentage of patients with no PABT needing HBT, reduced from 83% for uncemented-THR patients with no-ABS to 70% for the same group of patients with ABS, (p<0.001). The p-value was less than 0.001 for all differences in the TKR group of patients.

**Clinical conclusions**
The benefit of PABT for both total hip and total knee replacement increased proportionately with increasing amount of autologous blood availability, and the authors observed that in patients undergoing joint replacement surgery, in order to reduce HBT significantly, a minimum of three units of PABT were required.

**Measure of benefits used in the economic analysis**
The benefit measure was the reduction in the percentage of patients requiring HBT.

**Direct costs**
Cost discounting was not required. Quantities were not fully reported separately from the costs. The cost items were reported separately. Direct health service costs were considered such as: the cost of providing a unit of whole blood (Red Cross, 1990) the cost of crossmatching with the recipient, the cost of PABT (using the Commonwealth Medical Benefits Schedule 1992), cost of blood tests, cost of oral iron for patients pre-depositing autologous blood. Both variable and fixed costs were included in the cost analysis. The perspective adopted in the cost analysis was not explicitly specified. The date of the price data was not explicitly specified.
Indirect Costs
Not considered.

Currency
Australian dollars (Aus$).

Sensitivity analysis
No sensitivity analysis was performed.

Estimated benefits used in the economic analysis
Depending on the type of surgery, one to three units of PABT eliminated the need for HBT in 50% to 78% of patients, but intra/postoperative blood salvage alone only reduced the need in 11 to 29%. In contrast, blood salvage, when combined with 3 units of PABT, eliminated the need for HBT in all patients undergoing primary joint replacement surgery.

Cost results
The cost per patient was as follows: 3 units of PABT, Aus$451; 3 units of HBT, Aus$394; ABS (variable), Aus$333; 3 units of HBT+ABS, Aus$691; and 3 units of PABT+ABS, Aus$784.

Synthesis of costs and benefits
Not performed.

Authors' conclusions
Depending on the type of surgery, one to three units of PABT eliminated the need for HBT in 50 to 78% of patients, but intra/postoperative blood salvage alone reduced the need only in 11 to 29%. In contrast, blood salvage, when combined with 3 units of PABT, eliminated the need for HBT in all patients undergoing primary joint replacement surgery. A cost comparison analysis showed that blood salvage was more expensive than PABT, and therefore it should be limited to patients who had predeposited fewer than three units of autologous blood.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator is clear.

Validity of estimate of measure of benefit
The internal validity of the retrospective study may be weakened by the lack of a randomised design, but the internal validity of the prospective study is likely due to the use of a randomised design (at least for ABS versus no ABS group).

Validity of estimate of costs
No date was provided for the price data. Costs and benefits were not combined although, from a methodological point of view, this would appear to have been required.

Other issues
The issue of generalisability to other settings/countries was not addressed.

Source of funding
None stated.

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