Intraoperative autotransfusion in hip arthroplasty
Shulman G, Greaca M J, Hadjipavlou A G

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
Patients undergoing primary or revision total hip replacement had apheresis with normovolemic haemodilution and autologous blood component preparation, which was then used as required during the surgery. The comparator group of patients were given autotransfusion without normovolemic haemodilution.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients undergoing primary or revision hip replacement who were otherwise healthy. The patients had to give informed consent. They also had to have a projected blood loss of 800 mL or greater, a minimum preoperative haematocrit of 35%, and a minimum platelet count of 150,000 per microL. Patients were excluded if they had donated autologous blood by preoperative deposit, or if there was a pre-existing coagulopathy.

Setting
The setting was secondary care. The economic study was carried out in Texas, USA.

Dates to which data relate
The dates to which the effectiveness evidence and resource use data related were not reported. The price year was not reported.

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

Link between effectiveness and cost data
The same patients provided both the effectiveness and cost data. There was insufficient evidence to determine whether or not the costing had been carried out prospectively.

Study sample
No power calculations were reported. The study group comprised the first 40 patients consenting to normovolemic haemodilution. These were then matched by age, gender and weight to 40 patients who declined normovolemic haemodilution but consented to autotransfusion. Thus, 80 patients were considered in the analysis. The mean age of the patients was 43 (+/- 12) years in the study group versus 44 (+/- 13) years in the control group. There were 24 males and
16 females in each group.

**Study design**
This was a non-randomised controlled trial that was performed in a single centre. There was no follow-up after hospital discharge. No loss to follow-up was reported.

**Analysis of effectiveness**
The basis of the analysis intention to treat. The primary health outcomes used were the total blood product transfusions, the number of hours in the operating room and the number of days in hospital. The haematocrit levels were also recorded. The following characteristics of the blood products used were recorded:

- per patient red cells,
- per patient autologous red cells,
- per patient donor red cells,
- percentage autologous of total red cells,
- per patient donor platelets, and
- per patient total donor exposures.

The groups were similar in terms of age, gender and weight.

**Effectiveness results**
The time in the operating room was similar in both groups, 4.6 (standard deviation, SD=1.9) hours for the haemodilution group and 5.2 (SD=1.4) hours for the autotransfusion alone group.

The length of stay in hospital was 6.2 (SD=2.1) days for the haemodilution group and 8.4 (SD=4.6) days for the autotransfusion group, (p<0.01).

The preoperative haematocrit levels were 39.9 (SD=3.8) for the haemodilution group and 37.5 (SD=6.2) for the autotransfusion alone group, (p<0.03).

The haematocrits obtained before surgery and at the time of discharge showed similar levels for the two groups.

The distributions of total per patient red cell transfusions of patients in the study and the control groups were similar.

Per patient autologous red cells used were 4.0 (SD=1.4) in the haemodilution group and 1.9 (SD=1.8) in the autotransfusion alone group, (p<0.01).

Per patient donor red cells used were 0.6 (SD=0.9) in the haemodilution group and 1.9 (SD=2.6) in the autotransfusion group, (p<0.03).

Per patient total donor exposures were 0.6 (SD=1.2) in the haemodilution group and 2.4 (SD=4.2) in the autotransfusion alone group, (p<0.01).

The total red cell volume returned, donor red blood cell transfusions, perioperative haematocrits, and the patients’ gender and body weight showed no correlation with length of hospital stay (correlation coefficient, r<0.2311).

**Clinical conclusions**
Patients receiving haemodilution needed less time in the operating room and less time in hospital than those receiving autotransfusion alone. They also received more autologous blood products and received fewer donor exposures.

Measure of benefits used in the economic analysis
No summary measure of benefits was produced. In effect, the authors carried out a cost-consequences analysis.

Direct costs
No discounting was carried out since the costs were incurred during less than one year. The costs measured were those of the hospital. The costs were broken down into the unit costs and quantities. The costs measured were the cost of banked blood products (including red cells, frozen plasma, platelets and surcharge for nucleic acid testing), the cost per autologous procedure (including salvage supplies, sequestration and labour costs) and the cost per red cell by autotransfusion. The resource quantities were estimated on the basis of the clinical study. The unit costs were taken from the authors' setting, based on a period of 4 years (no dates were reported). No price year was given.

Statistical analysis of costs
No statistical analysis of the costs was carried out.

Indirect Costs
No indirect costs were calculated.

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
The total cost per patient was $19,628 in the haemodilution plus autotransfusion group, and $25,728 in the autotransfusion alone group.

It appears that the costs of adverse effects have not been included in the analysis.

Synthesis of costs and benefits
The costs and benefits were not combined as the study was, in effect, a cost-consequences analysis.

Authors' conclusions
Haemodilution, followed by autotransfusion, was cost-effective in patients undergoing hip primary and revision total hip replacement. These patients had better outcomes, and their treatment was less expensive than the treatment given to those patients who underwent autotransfusion alone. The authors reported that autotransfusion alone was cost-effective only in revision arthroplasty, but they did not report any data justifying their conclusion.
CRD COMMENTARY - Selection of comparators
The choice of the comparator, autotransfusion without normovolemic dilution, was implicitly justified by the fact that it represents common 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 source of the effectiveness data was a single study. The study design was appropriate for the hypothesis: although it was not a randomised controlled trial, there was no reason to assume that patients who did not consent to haemodilution would have different health outcomes. However, it was unclear whether the patients in the study were representative of patients undergoing hip arthroplasty, as the mean age was less than 45 years and they were all in good health apart from requiring the operation. This fact may limit the external validity of the study. The fact that there were no statistically significant differences in time in the operating room or haematocrit levels between the two groups might have been due to the small sample size and the consequent lack of power of the study. The effectiveness analysis was handled credibly and the patient groups were shown to be comparable at baseline.

Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefits. The health benefits are therefore those associated with the effectiveness outcomes.

Validity of estimate of costs
The perspective adopted was not stated clearly, but it appears to have been that of the hospital. Most of the categories of cost relevant to this perspective were included in the study. However, one category of costs was omitted: patients in the control group spent slightly longer in hospital, and the cost of this longer hospital stay was not included. Nevertheless, this omission has not affected the authors' results. The costs were broken down into prices and quantities, which will increase the generalisability of the authors' results. The resource use quantities were taken from a single study, while the unit costs were taken from the authors' setting. No statistical or sensitivity analyses of the quantities or prices were carried out. These facts limit the generalisability of the results. The price year was not reported, which will hamper any possible future inflation exercises. Discounting was not performed, which was appropriate as all the costs were incurred during less than two years.

Other issues
The authors compared their results with the findings from other studies. They did not, however, address the issue of generalisability to other settings. The authors did not present their results selectively, nor did they report any limitations of their study. The authors acknowledged that their results were derived from otherwise healthy patients, but did not draw attention to their relatively young age.

Implications of the study
The authors concluded that their study provides further argument in favour of normovolemic haemodilution with autotransfusion, some advantages of which have already been established. For example, a reduction in the risk of donor-related complications and allowing Jehovah's Witnesses to benefit from autotransfusions.

Source of funding
None stated.

Bibliographic details