Postoperative autologous blood salvage drains: are they useful in primary uncemented hip and knee arthroplasty? A prospective study of 186 cases

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 postoperative autologous blood salvage drains (CellTrans, Summit Medical) for uncemented hip and knee arthroplasty was examined.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The population comprised patients undergoing primary elective unilateral uncemented hip or knee arthroplasty.

Setting
The setting was secondary care. The economic study was carried out in a district general hospital in Surrey, UK.

Dates to which data relate
The effectiveness data and cost data were collected between 1 March and 30 November 2002.

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

Link between effectiveness and cost data
The cost data were derived prospectively for the same patient sample as that used for the effectiveness analysis.

Study sample
From July 2002, because of a change in policy at the authors' hospital, postoperative autologous blood drainage transfusion systems were used in the hospital for hip and knee arthroplasty, in place of the conventional closed suction drains (Bellovac for knee and Endovac for hip arthroplasty; Astra Molndel). Ninety-two consecutive patients operated on in the 4 months prior to the change in policy were compared with 94 consecutive patients in the 4 months after the change. Power calculations were not performed to calculate the sample size. The mean age of the sample was 68.9 (+/- 10.9) years (range: 27 - 91).

Study design
This was a single-centre, cohort study with historical controls. There were no missing data. In both groups, the decision to transfuse operatively or postoperatively was based on a transfusion protocol, full details of which were given in the paper.

**Analysis of effectiveness**

The analysis of effectiveness was conducted on an intention to treat basis. The primary outcome for the clinical study was the number of units of allogenic blood received by the patient. Length of stay was also reported. A logistic regression analysis was undertaken to determine if any of the other factors, including age, gender and joint replaced, affected whether or not the patient received a blood transfusion. The two groups were similar in other respects (i.e. gender distribution, average age and preoperative haemoglobin).

**Effectiveness results**

Forty-six per cent of group A (conventional closed suction drain group) received allogenic blood compared with 22% in group B (autologous blood drainage transfusion system group), (p=0.001). The odds ratio was 2.92 (95% confidence interval, CI: 1.546 - 5.514).

Group A received 113 units of allogenic blood while group B received 51 units.

There was a statistically significant difference in the mean amount (units of packed red cells/patient) of allogenic blood transfused between the two groups, with the re-transfusion group receiving 0.54 units and the suction drain group receiving 1.23 units, (p=0.003).

Length of stay was significantly reduced in the re-infusion group compared with the suction drain group (11 days versus 12.6 days; p=0.0248).

The only factor that determined whether the patient needed allogenic blood transfusion was preoperative haemoglobin. All other factors analysed in the regression analysis were non significant.

**Clinical conclusions**

Patients with the re-transfusion drains needed significantly less allogenic blood transfused and a shorter length of stay than patients with conventional drains. Preoperative haemoglobin is a significant indicator of transfusion requirements.

**Measure of benefits used in the economic analysis**

The authors did not use a summary benefit measure in the economic analysis. As such the study can be classified as a cost-consequences study.

**Direct costs**

The estimation of the quantities and costs was based on data from the study, but the quantities and the costs were not reported separately. The quantity of resources was measured during the study period. Discounting was not carried out, but was not relevant as the costs were incurred during less than 2 years. The mean transfusion and laboratory costs incurred in the two groups, as well as the mean cost of disposables, were used to estimate the overall cost. The costs of allogenic blood and laboratory services were calculated using prices quoted by the transfusion service at the authors' institute. The cost of hospital stay was not included. The price year was not specified.

**Statistical analysis of costs**

Mean values and p-values were provided. The authors employed a number of statistical tests, according to the characteristics of the data (binary, parametric, non-parametric, etc.). Although not stated in the paper, the Mann-Whitney test the authors used was most likely used for costs.
Indirect Costs
The indirect costs were not included.

Currency
UK pounds sterling ( ).

Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
Owing to the cost-consequences approach, the reader is referred to the 'Effectiveness Results' section.

The side effects of treatment were not considered in the analysis.

Cost results
The mean transfusion and laboratory costs were 176.53 in group A (conventional closed suction drain) and 116.91 in group B (autologous blood drainage transfusion system).

The cost of disposables was 20.20 in group A, and 65.80 in group B.

The overall cost was 196.75 in group A and 182.70 in group B, (p=0.009).

Synthesis of costs and benefits
The costs and benefits were not combined because of the cost-consequences approach.

Authors' conclusions
The introduction of a postoperative autologous blood transfusion drain was an effective means of reducing allogenic transfusion requirements in patients undergoing primary elective uncemented total hip or knee arthroplasty. The cost analysis showed a small but significant reduction in cost with the autologous transfusion drain.

CRD COMMENTARY - Selection of comparators
No explicit justification was given for the comparator used, but it would appear to have been current practice in the authors' setting until the policy was changed in July 2002. You should consider whether this is a widely used technology in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on a retrospective cohort study with historical controls, which was appropriate for the study questions. However, because historical controls were used, confounding due to concurrent changes over time cannot be ruled out. A prospective, randomised design might have been preferable for eliminating potential bias and confounding factors, but it is possible that this was not feasible because of the change in practice over the study period. The follow-up period might have been insufficient to answer the question about the safety of the autologous transfusion drain system. The study sample was representative of the study population and the patient groups were shown to be comparable at analysis. The estimates of effectiveness are likely to be valid because of the absence of selection bias, group allocation being decided by the date on which hospital policy was changed (to replace suction drains with the re-transfusion drains). There were no missing data. Appropriate statistical analyses were performed and clearly reported.
Validity of estimate of measure of benefit
The estimate of benefits used was obtained directly from the effectiveness analysis in the form of a cost-consequences approach. The comments in the 'Validity of estimate of measure of effectiveness' field (above) therefore apply.

Validity of estimate of costs
The authors acknowledged that not all categories of cost relevant to the perspective adopted were included in the study. The inclusion of hospitalisation costs would have further biased the results in favour of the re-transfusion drains, as the mean duration of stay was less in this group. Although some costs were omitted from the analysis, these are unlikely to have affected the authors' conclusions. The costs and the quantities were not reported separately, but a statistical analysis of the mean costs was performed. Since all the costs were incurred in less than 2 years, discounting was unnecessary and was not carried out. The date to which the prices related was not reported, but these were obtained at the time of the study.

Other issues
The author made appropriate comparisons of their findings with those from other studies. The issue of generalisability to other situations was not addressed. The authors did not present their results selectively. The study considered patients with uncemented arthroplasty, in which the need for transfusion was greater, and therefore showed more benefit with re-transfusion drains. This was reflected in the authors' conclusion. The authors reported further limitations of their study. In particular, the small size of the sample and the relatively short follow-up to determine the safety of autologous transfusion drainage systems.

Implications of the study
The use of a postoperative autologous blood re-transfusion drain is a cost-effective means of reducing the requirement for allogenic blood transfusion following primary elective uncemented hip or knee arthroplasty. Larger studies with longer patient follow-up are required to determine the safety of postoperative autologous transfusion drainage systems.

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