Effect of human albumin administration on clinical outcome and hospital cost in patients with subarachnoid hemorrhage

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 human albumin to induce hypervolemia (central venous pressure >8 mmHg) after subarachnoid hemorrhage (SAH).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised adult patients admitted to the neurosciences critical care unit (NSU) between May 1998 and May 2000, with a confirmed aneurismal rupture and subsequent clip occlusion or endovascular treatment.

Setting
The setting was secondary care. The economic study was carried out in Cleveland (OH), USA.

Dates to which data relate
Both the effectiveness and resource data related to May 1998 to May 2000. A price year was not stated.

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

Link between effectiveness and cost data
The costing was performed retrospectively from the same study sample as that used for the effectiveness data.

Study sample
A review of medical records identified 164 patients who were treated for SAH during the study period. Of these, 24 were excluded from the analysis for having no evidence of cerebral aneurysm on cerebral angiography studies, having an arteriovenous fistula and arteriovenous malformations. The remaining 140 patients were divided into two groups, those treated between May 1998 and May 1999 (group 1) and those treated between June 1999 and May 2000 (group 2). Group 1 comprised 63 patients (16% male) and group 2 comprised 77 patients (33% male). The average age of the patients was 55 years in group 1 and 58 years in group 2.
Study design
This was a retrospective comparative study with historical controls that was based around a change in hospital policy in May 1999. It was undertaken in a single NSU in Cleveland (OH), USA. Glasgow Outcome Scale (GOS) scores were obtained either from outpatient records or via telephone interviews 3 months after discharge. Eleven patients (5 in group 1 and 6 in group 2) were lost to follow-up and were assigned the worst possible outcome score.

Analysis of effectiveness
The analysis of effectiveness was carried out on all patients included in the study (i.e. 140 patients). The primary outcome measure used was the GOS. For statistical analysis, the GOS was dichotomised as a good outcome (scores 4 - 5) or poor outcome (scores 1 - 3). A logistic regression analysis was used to identify good outcome at 3 months (based on the GOS), and these were adjusted for age, gender, race and the Glasgow Coma Scale (GCS). Group 1 (prior to May 1999) was compared with group 2 (after June 1999). An additional sub-group analysis comparing just those patients who received human albumin (n=37) and those who received extra boluses of normal saline (n=47) was also undertaken.

Effectiveness results
The results of the initial group analysis (before and after May 1999) were as follows.

GCS score less than 8: 22% (group 1) versus 31% (group 2); (p=0.2).
Baseline central venous pressure: 5.2 mmHg (group 2) versus 4.8 mmHg, (p=0.6).
Symptomatic vasospasm: 13% (group 1) versus 18% (group 2), (p=0.3).

Logistic regression (adjusted for age, gender, race and GCS less than 8) found that the administration of human albumin was not a predictor of in-hospital death or poor clinical outcome at 3 months after discharge.

The results of the sub-group analysis were presented in full in the paper.

Clinical conclusions
The administration of human albumin was not found to be harmful for this patient population. It was an independent predictor of better outcomes at 3 months after SAH. It was not found to have an effect on in-hospital death.

Measure of benefits used in the economic analysis
The health outcomes were left disaggregated and no summary benefit measure was produced. In effect, a cost-consequences analysis was performed.

Direct costs
The direct costs included in the analysis were the total hospital, laboratory and radiological costs. The resource use quantities and the unit cost were reported separately in so far as days in hospital and days in the NSU were presented, as well as the total hospital, laboratory and radiological costs. Full details of the costings were not provided, but they appear to have been based on actual data and costs, as recorded in patient medical reports. The data pertained to the years 1998 to 2000 and were corrected for inflation, although further details of this were not given. Discounting was not relevant because of the short timeframe of the analysis. The price year was not reported.

Statistical analysis of costs
Descriptive statistics including means and standard deviations were reported for each group. A Kolmogorov-Smirnov test for normality and an equal variances test were undertaken before further statistical analysis. The resource use and cost data were analysed using two-tailed t-tests.
Indirect Costs
The indirect costs were not considered in the evaluation.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was undertaken.

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

Cost results
The total hospital cost (in $1,000) was $62.0 for group 1 versus $81.0 for group 2, (p=0.02).

The laboratory cost (in $1,000) was $3.7 for group 1 versus $4.4 for group 2, (p=0.3).

The radiology cost (in $1,000) was $15.0 for group 1 versus $23.0 for group 2, (p<0.01).

The total hospital costs were significantly higher in group 2 than in group 1. This difference was mainly driven by higher radiology costs.

No cost data or comparisons were presented for the sub-group analysis.

Synthesis of costs and benefits
Not relevant.

Authors' conclusions
The data indicated that human albumin is not harmful for this patient population and that it may be neuroprotective, as shown by improved clinical outcomes after discharge and fewer in-hospital neurological complications. The data also indicated that human albumin administration is not associated with increased health care expenditures in patients with subarachnoid haemorrhage (SAH) when total hospital cost is used as a surrogate measure. The authors stated that their findings indicated that, despite the cost associated with human albumin treatment ($1,500/day or less), its beneficial effects may offset the expense.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. The hospital changed its policy, restricting the use of human albumin and using normal saline (the alternative) instead. You should decide whether this represents a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The analysis of effectiveness was based on a retrospective sample with a historical control, which was appropriate to ascertain the change in outcome relative to the change in hospital policy. However, a randomised controlled trial might have been a superior study design with which to compare efficacy. The study sample was representative of the study population given the retrospective design of the study. The groups were comparable at baseline, although group I (patients treated prior to May 1999) contained fewer men. Effectiveness was compared using both simple statistical
comparators and logistic regression. The logistic regression appropriately controlled for potential confounding factors. No power calculations were reported, so it was not possible to determine whether the sample was large enough to detect statistically significant differences.

**Validity of estimate of measure of benefit**
No summary benefit measure was employed in the analysis as a cost-consequences analysis was conducted. Please refer to the comments in the 'Validity of estimate of measure of effectiveness' field (above).

**Validity of estimate of costs**
The perspective of the study was not stated, but it appears to have been that of the hospital or provider. A detailed breakdown and discussion of the resource use and costs included in the analysis were not included, thus limiting the generalisability of the study. In general, the cost analysis was limited and a comparative analysis was only undertaken for groups 1 and 2 (before and after May 1999), and not the sub-group analysis (albumin and nonalbumin recipients). A discussion of cost within the sub-group analysis would have further informed any recommendation on the use of human albumin.

**Other issues**
The authors made some comparisons of their findings with those from other studies. However, they did not directly address the issue of generalisability of the results to other settings. They do not appear to have reported their results selectively, although it would have been helpful had the results for the sub-group analysis been presented. The authors acknowledged that the main limitation of the study lay in its retrospective, non-randomised design with a small study sample, which may have introduced bias. A greater analysis of the cost implications is required before recommendations on resource allocations should be made.

**Implications of the study**
Further validation of the data with appropriate prospective studies is needed before human albumin administration can be recommended as a neuroprotective therapy for patients with SAH.

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