Rehabilitation outcomes of cardiac and non-cardiac anoxic brain injury: a single institution experience

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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 study examined inpatient rehabilitation providing comprehensive, multi-disciplinary rehabilitation services in two groups of patients. The groups studied were patients with anoxic brain injury (ABI) due to cardiac aetiologies and patients with ABI due to non-cardiac aetiologies.

Type of intervention
Rehabilitation.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients who had suffered ABI from either cardiac or non-cardiac causes. The cardiac group included patients who sustained ABI due to cardiac dysfunction such as myocardial infarction, or cardiopulmonary arrest. The non-cardiac group included patients who sustained ABI due to near drowning, respiratory failure, or attempted suicide.

Setting
The setting was tertiary care (a free-standing rehabilitation hospital). The economic study was carried out in the USA.

Dates to which data relate
The exact dates when the effectiveness data, resource use and prices were collected were not reported. However, the authors reported that the effectiveness data were collected for patients admitted over the last 4 years and the study was published in 2005.

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

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that used in the effectiveness study.

Study sample
The sample was selected by including consecutive charts of patients admitted to the Spaulding Rehabilitation Hospital (Boston, USA) over the last 4 years with a diagnosis of ABI. There was no report that power calculations were carried out to estimate the impact of chance on the results. Twenty-six patients entered the study, 13 with non-cardiac...
Study design
The authors designed a retrospective cohort study with two groups defined by the aetiology of their ABI. All patients were based at a single centre. The patients' charts were reviewed retrospectively, with no report that those analysing the charts were blinded. The patients appear to have been followed up until discharge.

Analysis of effectiveness
The analyses were based on the aetiology of the patients. The primary health outcomes were:

- the Functional Independence Measure (FIM) and the relevant sub-sets of this measure (activities of daily living, mobility, and cognition) taken at admission and discharge;
- rehabilitation length of stay (LOS); and
- discharge disposition.

The groups were compared at baseline in terms of their age, gender, ethnicity and marital status, and no statistically significant differences were found.

Effectiveness results
The mean total FIM at admission was 49.54 (standard deviation, SD=32.98) in the non-cardiac group and 63.92 (SD=32.82) in the cardiac group, (p=0.362).

The mean total FIM at discharge was 81.31 (SD=38.63) in the non-cardiac group and 90.46 (SD=41.37) in the cardiac group, (p=0.479).

The mean FIM efficiency (i.e. the change in FIM divided by length of stay, giving a measure of daily improvement) was 0.779 (SD=0.788) in the non-cardiac group and 1.47 (SD=1.22) in the cardiac group, (p=0.169).

When the FMI sub-set scores were considered, the only statistically significant difference was found in terms of the mobility efficiency. The average score was 0.3275 (SD=0.431) for the non-cardiac group versus 0.757 (SD=0.785) for the cardiac group, (p=0.05).

The average LOS was 69.84 (SD=59.36) days in the non-cardiac group and 41.69 (SD=42.47) days in the cardiac group, (p=0.264).

After treatment, 54% of patients in the non-cardiac group versus 85% in the cardiac group were discharged to home, 31% (non-cardiac group) versus 15% (cardiac group) were discharged to a nursing home facility, and 15% (non-cardiac group) versus 0% (cardiac group) were discharged to an acute care hospital, (p=0.063).

Clinical conclusions
Functional outcomes were not found to be significantly different between patients with ABI due to cardiac versus non-cardiac dysfunction. However, there was a trend for the cardiac group to show higher mobility scores at discharge and to be discharged to home more often.

Measure of benefits used in the economic analysis
The authors did not estimate a summary measure of health benefits. The study was therefore categorised as a cost-
consequences analysis.

Direct costs
The authors did not report a perspective for the analysis, but it appears to have been that of the health care provider. The analysis was limited to charges associated with the LOS in the hospital. The costs were observed for the same period as the effectiveness outcomes. A price year was not reported. Discounting was not required because of the relatively short period of follow-up defined by the LOS.

Statistical analysis of costs
Statistical analyses of the costs were carried out and p-values were reported.

Indirect Costs
The indirect costs were not estimated.

Currency
US dollars ($).

Sensitivity analysis
There was no report that sensitivity analyses were carried out.

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

Cost results
The median charges were $58,187 (SD=52,037; range: 4,112 to 209,668) for the non-cardiac group and $44,181 (SD=58,587; range: 5,044 to 215,429) for the cardiac group, (p=0.153).

Synthesis of costs and benefits
Not relevant since a cost-consequences approach was undertaken.

Authors' conclusions
Cardiac patients were less costly to treat because of their shorter stay in hospital. They also showed a trend towards better mobility at discharge and to be more frequently discharged to home than non-cardiac patients.

CRD COMMENTARY - Selection of comparators
The authors assessed inpatient rehabilitation providing comprehensive, multi-disciplinary rehabilitation services for ABI patients with cardiac versus non-cardiac aetiologies, in order to evaluate whether the cost-effectiveness varied across these two study groups.

Validity of estimate of measure of effectiveness
The authors designed a retrospective cohort study to compare the two different types of patient, those with cardiac and those with non-cardiac aetiologies. This design might have been appropriate for the study question posed given the type of data available, although it would be subject to biases such as those related to the retrospective nature of the analysis. Although the study sample comprised patients with ABI identified through chart review in the hospital and it might
have been representative of that specific setting, there was no evidence that it was representative of the overall study population. The patients groups and the clinical outcomes were shown not to be statistically different during comparisons at analysis, but with a sample size of only 26 the power of the study to demonstrate differences was very low. The authors acknowledged this as a weakness of their study. They also discussed several other limitations, such as the differences in support (i.e. marital status) presented by patients in the two groups and the fact that co-morbid conditions were not considered.

**Validity of estimate of measure of benefit**
The authors did not estimate a summary measure of health benefit. The study was therefore categorised as a cost-consequence analysis. The reader is referred to the comments in the 'Validity of estimate of measure of effectiveness' field (above), as the health benefits were reflected in the disaggregated effectiveness outcomes.

**Validity of estimate of costs**
The authors seem to have estimated the costs from the perspective of the health care provider, although this was not explicitly stated. The indirect costs were not estimated, but were not relevant given the perspective apparently adopted. Charges instead of costs were used for the estimation of costs, and no adjustments were performed in order to reflect the true opportunity cost of the intervention. The analysis might have been improved by providing a breakdown of the cost categories and providing further details of the methodology, since limited details were reported in the paper. The lack of a price year would limit reflation exercises to other settings. Nevertheless, appropriate statistical analyses were carried out.

**Other issues**
The authors made some comparisons of their findings with those of other authors. They also acknowledged the difficulties in making such comparisons given differences in the patient population, rehabilitation processes, severity of injuries and outcome measures. The issue of generalisability was not addressed, and it was limited by the use of institution-specific costs and the lack of explicit dates for when the effectiveness and resource use data were collected. The results related to the clinical question posed and the conclusions were an accurate representation of the results reported.

**Implications of the study**
The authors recommended that "patients with ABI due to all aetiologies are good rehabilitation candidates and can achieve significant gains during the rehabilitation process and should not be neglected." Areas for further work centred on addressing the limitations of study, such as increasing the sample size and assessing co-morbid conditions.

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**Other publications of related interest**
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