Outcomes and resource utilization for patients with prolonged critical illness managed by university-based or community-based subspecialists

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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
Management of patients with prolonged critical illness in a long-term acute care facility (LTAC) by university-based clinicians and fellow trainees (UB).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients with prolonged critical illness, requiring a prolonged course of mechanical ventilation or other critical modality, regardless of the severity of illness, and who were stable for transfer. Patients who had received care at their transferring facility from either the CB group or the UB group were excluded from the analysis.

Setting
The study setting was secondary care, namely a long-term acute care facility (LTAC) based in a hospital located in a large urban community. Patients were transferred to this LTAC from 37 acute care hospitals in the area. The economic study was conducted in Chicago, Illinois, USA.

Dates to which data relate
Effectiveness data were collected between 1 August 1995 and 31 July 1996. 1998 standard Medicare provider reimbursements for Current Procedural Terminology (CPT) regarding management of critically ill patients were used as proxy for costs which were expressed in 1998 US dollars.

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

Link between effectiveness and cost data
Provider reimbursements were used as proxy for costs, but the calculation of total reimbursements was simulated retrospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
185 patients transferred to the LTAC from 37 acute care hospitals in the area were screened, but all patients who had received care at the transferring facility from either the CB group (51 patients) or the UB group (16 patients) were
excluded from the analysis, leaving a final sample of 118 patients (42 CB and 76 UB). Patients were assigned to either the UB service or the CB service in a non-selective manner on an alternating basis by the admissions co-ordinator, unless the patient had been managed previously by one of the physician groups at another hospital. These patients were automatically admitted under the same physician group's care. It was stated that, if the census on one service became disproportionately large, the smaller service would receive additional previously unknown patients out of the alternating rotation. No power calculations were used in determining the sample size.

**Study design**
The study was a randomised-controlled trial, using an informal randomisation method. The study was conducted in a single LTAC receiving admissions from 37 acute care hospitals. The duration of follow-up was 1 year. Follow-up at 1 year was 100%. Blinding, including that for chart reviewers, was not mentioned.

**Analysis of effectiveness**
The analysis was based on intention to treat and treatment completers. The main health outcomes used in the analysis were length of stay (LOS), time to liberation from mechanical ventilation (MV), likelihood of liberation from MV and mortality during the 1-year study period, and frequency of do not resuscitate (DNR) orders. Survival at 1-year was assessed by follow-up telephone interviews of patient or families, performed by a nursing care manager or by examination of Medicare records. The two groups (UB/CB) were stated to be comparable in their baseline characteristics (mean; all p values >0.1) viz; age (70 years), APACHE II score (23/22), serum albumin g/dl (2.3/2.4), hospital days prior to admission (31.6/29.7), functional level (24.1/23.1), gender (percentage male 50/54) and alveolar-arterial oxygen gradient mm Hg (147/129). Three trained chart reviewers abstracted all clinical information. Successful liberation from MV was defined as being independent of MV for seven consecutive days and nights, regardless of outcome after that period. A Kaplan-Meier plot stratified by care provider was used to illustrate survival over the first year after treatment. Statistical tests were appropriate for the data.

**Effectiveness results**
Length of stay (mean) (all patients) was 57(5.1) days in the UB group and 70(8.7) days in the CB group (p=0.19) and length of stay (survivors) was 68(7) days in the UB group versus 88(11) days in the CB group (p=0.12).

Patients in the UB group were liberated from MV in 32% fewer days (39(5) days versus 57(11) days, p=0.09) and were more likely to be liberated from MV (26/56 (46%) versus 9/30 (30%), p<0.14).

At 1 year, mean survival was 29% (95% CI: 19% - 39%) for patients in the UB group versus 18% (95% CI: 8% - 31%) for patients in the CB group).

Only 33% of the patients in the CB group ever had DNR orders, compared with 59% in the UB group (p<0.01).

**Clinical conclusions**
UB management of patients with prolonged critical illness provides quicker liberation from MV and LTAC as well as longer survival than CB, although this study only found statistical significance at the 5% level (2-way) for speed of liberation from MV.

**Measure of benefits used in the economic analysis**
The authors did not provide a summary measure of benefits and, as such, a cost-consequences analysis was conducted.

**Direct costs**
Medicare provider reimbursements were used to estimate costs. Current Procedural terminology (CPT) codes regarding management of critical ill patients were used, as follows: any ICU day was designated 'critical care, evaluation and management, first hour’ CPT 99291 and reimbursed at $196.18/day. Any day on the medical floor on MV was
designated both ‘ventilation assist and management; subsequent day’ CPT 95657, reimbursed at $54.12/day and 
'subsequent hospital care, straightforward/low complexity' CPT 99231, reimbursed at $37.65/day. The latter included 
young days on the hospital floor not on MV. Quantities (days) and costs (reimbursements/day) were presented separately; 
costs were not discounted due to the short duration of the study. 1998 Medicare reimbursements were used. The price 
year was 1998.

Statistical analysis of costs
Differences in physician's reimbursements were tested using the Wilcoxon-Mann-Whitney rank sum test.

Indirect Costs
Indirect costs were not reported.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was performed.

Estimated benefits used in the economic analysis
The authors did not provide a summary measure of benefits; the reader is referred to the effectiveness results reported 
above.

Cost results
Physicians from the CB group were reimbursed 29% more per patient stay physicians in the UB group ($5,961 per 
patient versus $4,633 per patient, p=0.12). For patients who survived to discharge, it was estimated that the CB group 
was reimbursed 46% more per patient stay than the UB group ($6,797 versus $4,651, p=0.03).

Synthesis of costs and benefits
Costs and benefits were not combined due to the cost-consequences approach adopted in the analysis.

Authors' conclusions
Patients with prolonged critical illness may experience different outcomes based on their physician provider. In this 
study, patients were liberated more quickly from MV, were withdrawn from life support more readily and were 
managed at lower cost by UB intensivists than by CB intensivists. The authors stated that the design of the study did not 
provide clear explanations for the differences in patient outcome between patients in the two groups. There may have 
been differences in technical ability, but the authors did not find evidence of differences in patient survival, and all 
physicians in the study were clinically active subspecialists in pulmonary and critical care medicine. An alternative 
explanation rests in the observation that UB and CB groups were different in the availability and continuity that they 
provided to patients at the LTAC, due to the fact that the UB group rotated monthly, while the CB group rotated 
weekly. The improved communication in the UB group may account for the greater number of patients having DNR 
orders and withdrawal of life-sustaining therapy in this group.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator, management of prolonged critical illness by community-based intensivists, 
is clear, as both treatments, using university and community-based physicians, were used in the authors setting. You, as 
a database user, should consider if this applies to your own setting.
Validity of estimate of measure of effectiveness
The analysis was based on a randomised trial, which was appropriate for the study question. The authors stated that, although patients were admitted to both services in an apparently nonbiased manner, the randomisation was not formal and in fact it is impossible to check for bias. The study sample was representative of the study population, but no power calculations were used to determine the sample size. Patient groups were shown to be comparable at analysis, although no further analysis to account for confounding was carried out.

Validity of estimate of measure of benefit
The authors did not provide a summary measure of health benefit and, as such, a cost-consequences analysis was carried out.

Validity of estimate of costs
1998 Medicare provider reimbursements were used to estimate costs, so from the perspective of the third party payer, all relevant categories of costs were included in the analysis, although generalisability to providers faced with different prices would be difficult. Quantities (days) and reimbursements/day were presented separately and quantities were statistically analysed. Discounting was not performed which was appropriate given the short duration of the study. 1998 prices were used.

Other issues
Appropriate comparisons were made with the results from similar studies and the issue of generalisability to other settings was addressed. The results do not appear to have been presented selectively. The authors emphasised some limitations of the study, namely: the study was based on a single LTAC and of two specific groups of physicians during a single year and, as such, it may not be indicative of other acute care settings or of all physicians caring for patients at LTAC hospitals; although patients were admitted to both services in an apparently nonbiased manner, the randomisation was not formal and when physician billing was simulated, the authors could not account for the extra costs of the pulmonary fellow trainees.

Implications of the study
The results provide evidence that patients suffering from prolonged critical illness experience an improvement in time to liberation from MV, withdrawal from life support, and cost of care when cared for by UB rather than CB physicians, within the caveats mentioned. It would seem reasonable to consider a statistical method to determine sample size for a larger, formally randomised, trial.

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