Can early extubation and intensive physiotherapy decrease length of stay of acute quadriplegic patients in intensive care: a retrospective case control study
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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 use of extubation and intensive physiotherapy, including an overnight on-call service, rather than tracheotomy, for preventing respiratory complications in acute quadriplegic patients in an intensive care setting. Physiotherapy for patients with a tracheotomy included manual hyperinflation, gravity-assisted drainage and suctioning. Physiotherapy for patients without a tracheotomy included intermittent positive pressure breathing (IPPB), gravity-assisted drainage and assisted coughing.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with a diagnosis of acute cervical cord lesion, resulting in complete quadriplegia, who required admission to an intensive care unit (ICU). Patients admitted to the ICU at the authors’ setting (the Austin and Repatriation Medical Centre) from other hospitals more than 24 hours after injury were excluded from the study. Also excluded were those who had a neurological condition that prevented the head-down position, and those who had undergone tracheotomy as a result of weaning failure or upper airway obstruction. Patients with other associated injuries were also excluded.

Setting
The study was undertaken in the Austin and Repatriation Medical Centre, Heidelberg, Australia.

Dates to which data relate
The effectiveness and resource use data related to patients treated between April 1997 and November 1999. 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 costing was carried out retrospectively on the same patient sample as that used in the effectiveness study.

Study sample
The study sample was selected from all patients admitted to the ICU between April 1997 and November 1999 with an acute cervical lesion that resulted in complete quadriplegia. The patients were selected for inclusion in the study through an historical audit of medical records. A total of 14 patients were included in the study. Seven patients who did not receive tracheotomy (intervention group) were identified. The mean age was 27 years, the mean injury level was C5, and all 7 patients were male. They were extubated and received intensive physiotherapy. Seven patients who received tracheotomy (control group) were matched for age, injury level and respiratory history. The mean age was 29 years, the mean injury level was C6, and 4 patients were males. No power calculations relating to the sample size were reported. The paper did not discuss how the study sample related to the study population.

Study design
This was a retrospective, case-control study that was conducted in a single centre. The patients were followed up until discharge from acute care. As the data were collected through an historical audit of medical records, the loss to follow-up was not an issue in this study.

Analysis of effectiveness
All the patients included in the study were accounted for in the analysis. The primary outcomes used were:

- the total number of physiotherapy treatments, including the number of physiotherapy treatments in the ICU and the number of physiotherapy treatments that took place during the night (21:00 to 06:00 hours);
- the number of days on mechanical ventilation;
- the length of stay in the ICU;
- the length of stay on the acute spinal ward following discharge from intensive care; and
- the time from injury to fixation of cervical lesion.

The paper reported that the two patient groups were comparable in terms of age, acute physiological and chronic health evaluation scores (APACHE 2), and forced vital capacity (FVC) and PaO2/FiO2 ratio at extubation and at the day of tracheotomy.

Effectiveness results
Five of the 7 patients in the intervention group required physiotherapy during the night compared with none of the control patients.

The intervention group required a mean of 35 physiotherapy treatments compared with 31 in the control group (difference not statistically significant).

The patients in the intervention group received a median of 19 treatments in intensive care compared with 26 in the control group, (p=0.047).

The patients in the intervention group required fewer days' mechanical ventilation (mean 4.7 days) compared with those in the control group (mean 12.7 days), (p=0.018).

The patients in the intervention group required a median of 6 days in intensive care compared with 13 days in the control group, (p=0.006).

There was no statistically significant difference between the two groups in the time from injury to lesion fixation, or in the length of stay in the acute spinal ward after discharge from the ICU.

No patient in either group required readmission to the ICU once discharged.
Clinical conclusions
The authors concluded that extubation and intensive physiotherapy resulted in a shorter stay in intensive care and was an effective alternative to routine tracheotomy.

Measure of benefits used in the economic analysis
The clinical outcomes and costs were left disaggregated. In effect, a cost-consequences analysis was conducted.

Direct costs
This study assessed the costs to the hospital in providing care. It reported the costs of patient days in the ICU and on the acute spinal ward, and the cost of physiotherapy treatments during the night. All other costs appear to have been excluded, as they were assumed to be the same between both patient groups. The resources used and the unit costs were reported separately.

The quantities of resources used were collected from an historical audit of the patients' medical records. The internal auditing and clinical costing department of the hospital in which the study was undertaken provided the cost data. The costs of a day in intensive care and a day on the acute ward were calculated by dividing the total patient-related expenditure of the unit by the total number of patient days. The costs of providing out-of-hours physiotherapy care were based on 2 hours' overtime for a physiotherapist with at least 3 years' postgraduate experience, plus 9% to cover administrative costs. The resource use data referred to care provided between April 1997 and November 1999. The price year was not reported. The costs were not discounted as they were incurred during less than one year.

Statistical analysis of costs
The cost data were treated deterministically.

Indirect Costs
No indirect costs were included in the study.

Currency
Australian dollars (Aus$).

Sensitivity analysis
No sensitivity analyses were undertaken.

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

Cost results
The total cost of providing out-of-hours physiotherapy care was Aus$448 per patient and Aus$2,240 for the patients in the study. The authors reported that the total saving from the reduced number of stays in the ICU was Aus$62,230 for the 7 patients in the intervention group. Thus, the overall saving to the hospital was Aus$59,990.

However, the calculations should be revised carefully. Using the quantities reported in table 2 of the paper and the mean cost per day reported in the 'Discussion' section, it would appear that the saving from the reduced number of stays in the ICU and acute ward was Aus$15,136 per patient and the total saving to the hospital was Aus$105,952. Thus, the overall saving to the hospital would be Aus$103,712.
Synthesis of costs and benefits
Not relevant.

Authors' conclusions
Extubation and intensive physiotherapy is as clinically effective as routine tracheotomy and represents a cost-saving alternative for intensive care units (ICUs) when compared with tracheotomy.

CRD COMMENTARY - Selection of comparators
The comparator was selected on the basis of what had been usual practice in the authors' setting. You should consider how this relates to usual practice in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness data were derived from a retrospective case-control study. The use of a non-randomised controlled trial may limit the validity of the effectiveness measure. The authors identified the need for a larger, prospective, randomised study to provide more robust evidence. The sample size was very small and no power calculations were reported. Thus, the sample size may have been insufficient to obtain robust results. The authors did not compare their study sample with the study population. It is therefore not possible to comment on the degree to which the sample was representative of the study population. The analysis of the results accounted for all the patients included in the study. The authors used Student's t-tests and the Mann Whitney U-statistic to identify statistically significant differences between the two groups. However, the statistical tests they used were not robust when using a total sample of only 14. The results of this study should therefore be treated with caution. The impact on patient satisfaction would also have been appropriate for assessing the clinical effectiveness.

Validity of estimate of measure of benefit
The authors did not derive a summary measure of benefit from their outcome data.

Validity of estimate of costs
The perspective of the hospital was adopted. The paper did not state whether costs not related to out-of-hours physiotherapy staff and days in intensive care were excluded, as they were the same in both patient groups, although the authors appear to have assumed this. This assumption is unlikely to affect the authors' conclusions. No discounting of the costs was performed, but this was appropriate since they were incurred during less than one year. The costs and the quantities of resources used were reported separately. The cost estimates were derived from a single centre and are therefore likely to be specific to the study setting. No statistical or sensitivity analyses were undertaken on the cost and resource use data. This means that the reliability of the results has not been assessed. The price year was not reported, which will prevent any future reflation exercises and comparisons. The cost calculations reported by the authors did not reflect true cost-savings. However, this is unlikely to affect the authors' conclusions.

Other issues
The authors compared their effectiveness data with other appropriate studies. They did not, however, consider whether their results could be generalised to other settings. The results appear to have been presented comprehensively and the conclusions reflect the scope of the study. The authors reported one limitation to their study (the fact it was a non-randomised trial), which has been highlighted already. The main drawback of the study was that appropriate statistical and sensitivity analyses were not performed on the outcome and cost values. Consequently, the internal and external validity of the study may be low.

Implications of the study
The authors acknowledged the need for a larger, randomised controlled trial to provide a more robust assessment of the clinical and cost-effectiveness of the two treatments considered in this paper.
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