Tracheotomy versus endotracheal intubation for airway management in deep neck space infections

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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
Two types of airway used to treat patients with deep neck space infections (DNSIs) were examined, namely tracheotomy versus endotracheal intubation.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with DNSIs. The inclusion criteria were a requirement for surgical drainage of the infection, impending airway compromise, the involvement of 2 or more deep anatomic fascial spaces, and the maintenance of an artificial airway after surgery.

Setting
The setting was secondary care. The economic study was conducted at the Parkland Memory Hospital in Dallas (TX), USA.

Dates to which data relate
The effectiveness and resource use data were gathered from January 1994 through February 1999. The prices were estimated during the 1999 to 2000 academic year.

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

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

Study sample
Power calculations to determine the sample size were not reported. A sample of 85 eligible patients was identified among all hospital charts of patients who had undergone tracheotomy or intubation at the study hospital from January 1994 to February 1999. There were 62 male patients (73%) and the mean age was 36.1 years. There were 34 patients in the tracheotomy group and 51 in the intubation group.
Study design
This was a retrospective cohort study that was conducted in a single centre, the Parkland Memory Hospital. The decision criteria used to allocate the patients to the study interventions were not reported. The length of follow-up was not stated, but it appears that the patients were followed until discharge. There appears to have been no loss to follow-up.

Analysis of effectiveness
All of the patients included in the initial study sample were taken into account in the effectiveness analysis. The health outcomes used in the study were hospital stay, stay in the intensive care unit (ICU), overall complication rate, and the rate of complications secondary to loss of airway. The baseline comparability of the study groups was not discussed.

Effectiveness results
The mean length of hospital stay was 4.8 (+/- 5.4) days (range: 3 - 10) for the tracheotomy group and 5.9 (+/- 4.6) days (range: 4 - 16) for the intubation group, (p = non significant);

the length of stay in the ICU was 1.1 (+/- 1.3) days (range: 0 - 3) for the tracheotomy group and 3.1 (+/- 1.6) days (range: 2 - 6) for the intubation group, (p<0.05);

the overall complication rate was 6% for the tracheotomy group versus 10% for the intubation group; and

the rate of complications secondary to loss of airway was 3% for the tracheotomy group versus 6% for the intubation group.

Clinical conclusions
The effectiveness study showed that tracheotomy was associated with significantly shorter ICU stay and fewer complications than endotracheal intubation.

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

Direct costs
Discounting was not relevant since the costs per patient were incurred during a short time. The unit costs were not reported, but the quantities of resources used were. However, a detailed breakdown of the costs was not given. The health services included in the economic analysis were stay in the ICU and ward, ventilator support, operating room, drainage procedure and tracheotomy. The cost/resource boundary adopted in the study appears to have been that of the hospital. The unit costs were estimated using actual data coming from the study hospital, while the resources used were estimated alongside the effectiveness study from January 1994 to February 1999. The prices were estimated during the 1999 to 2000 academic year.

Statistical analysis of costs
No statistical tests of the costs or resources used were conducted.

Indirect Costs
The indirect costs were not considered in the economic evaluation.

Currency
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were not carried out.

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

**Cost results**
The total costs were $5,316.50 in the tracheotomy group and $8,739.00 in the intubation group.

**Synthesis of costs and benefits**
Not relevant as a cost-consequences analysis was conducted.

**Authors’ conclusions**
Both procedures were safe and effective. However, tracheotomy was associated with a lower complication rate and fewer days spent in the intensive care unit (ICU). This resulted in lower costs in the tracheotomy group in comparison with the endotracheal intubation group.

**CRD COMMENTARY - Selection of comparators**
The authors justified the choice of the two procedures compared in the analysis. They stated that three methods of airway management exist, namely observation, endotracheal intubation and tracheotomy. The option of observation was not considered feasible, thus the choice of the other two procedures was appropriate. You should decide whether they represent valid comparators in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis of effectiveness used a retrospective cohort study. There were several drawbacks to this study. First, the method used to allocate the patients to the study interventions was not described due to the lack of data in the patient charts. Second, power calculations were not conducted and there was no evidence that the sample size was appropriate. Third, the baseline comparability of the study groups was not shown. Fourth, the outcome measures did not directly estimate the impact of the study interventions on the patients’ health, but represented indirect measures. Also, the method of outcome assessment was not described. Finally, the lack of random procedures to allocate the patients to the study groups means that there is the possibility that bias and confounding factors affected the results of the effectiveness study. These issues tend to limit the internal validity of the study.

**Validity of estimate of measure of benefit**
No summary benefit measure was used in the economic analysis. The analysis was therefore categorised as a cost-consequences analysis.

**Validity of estimate of costs**
The perspective adopted in the study seems to have been that of the hospital where the procedures were conducted. Hospital data were used to estimate the costs, but it was unclear whether charges or true costs were used. Data came from an academic hospital and may not be generalisable to other health care providers. The unit costs were not reported, but the quantities of resources used were. The time during which the resource use and prices were collected was stated, thus facilitating reflation exercises in other settings. However, the cost estimates were specific to the study setting and no sensitivity analyses were conducted. The costs were treated deterministically. The cost components were
presented in grouped categories.

**Other issues**
The authors made extensive comparisons of their findings with those from other studies and reported the recommended method of airway management in 19 published studies. It appears that oral and maxillofacial surgeons preferred endotracheal intubation, while otolaryngologists preferred tracheotomy. The authors discussed the particular advantages and disadvantages of each procedure under study and the relevance of such issues in deciding which is the most appropriate procedure.

**Implications of the study**
The study results suggested that the choice of which approach is preferred for airway management depended strongly on the patient characteristics, although tracheotomy was associated with fewer days spent in the ICU and lower costs in comparison with endotracheal intubation.

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