Percutaneous dilatational tracheostomy: a safe, cost-effective bedside procedure
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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
Percutaneous dilatational tracheostomy (PDT) using a commercially available kit, the Ciaglia Percutaneous Tracheostomy Introducer Set (Cook Critical Care, Bloomington, Ind) in the intensive care unit.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
All patients in the intensive care unit (ICU) referred to a general surgeon for tracheostomy.

Setting
The setting was a university affiliated tertiary care teaching hospital. The economic study was performed in Portland, USA.

Dates to which data relate
The clinical data were collected for patients treated with PDT from January 1994 to the end of July 1995. Cost data were collected for patients treated by PDT who fulfilled financial inclusion criteria and for patients treated by standard tracheostomy who fulfilled criteria for control group inclusion during the same 19 months.

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

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

Study sample
All patients referred to a single general surgeon (one of the authors) for tracheostomy during the study period were considered for PDT. 65 PDTs were performed or supervised by this surgeon. The group was 60% male, with a mean (+/-SD) age of 56 (+/- 22) years (range 2-92 years). The surgeon also performed 1 additional standard tracheostomy, but it was not stated whether this case could have been considered for the study. Five patients still had tracheostomy tubes in place at last follow up and 7 patients (11%) were lost to follow-up. The longest follow-up time reported was 18 months (mean 7.5 months).
Study design
The study was a case series.

Analysis of effectiveness
The analysis was based on completion of the procedure. Intraoperative complications, postoperative complications and deaths were reported.

Effectiveness results
Percutaneous dilatational tracheostomy was completed in 65 patients (100%). Intraoperative complications (none of which resulted in serious morbidity) occurred in 14 (22%) patients. Early postoperative complications occurred in 6 (9%) patients and 1 of these led to a patient death. Late postoperative complications were reported in 2 patients (3% of the total and 7% of those with tracheostomy tubes removed and available for follow-up). Twenty patients (31%) died during hospitalisation and 5 (8%) died after discharge.

Clinical conclusions
The study showed that PDT was a safe and less-invasive technique, which also obviated the need for transporting critically ill patients from their optimal intensive care unit environment.

Modelling
None was used.

Measure of benefits used in the economic analysis
The measure of benefit was the completion of the procedure.

Direct costs
Patient charges generated by tracheostomies were used as a surrogate for true hospital costs. Financial data were available for 53 patients of the 65 treated by PDT, in whom tracheostomy was not combined with other operations. Of these, 28 had PDT performed in the operating room under anaesthetic, 17 in the ICU under anaesthetic and 8 in the ICU without anaesthetic. A control group of 42 patients was chosen from the 72 patients who underwent ST during the same study period. The group was restricted to patients in the ICU, who received mechanical ventilation, for whom complete financial data was available and in whom tracheostomy was not combined with any other operations. A fixed charge was used for the surgeon's fee and for equipment. Other charges were patient-specific and were based on the time spent in the OR and charges for medication and anaesthesia. No discounting was performed. Prices and quantities were not reported separately, although the length of time taken for the operation and time required in the OR were given separately.

Statistical analysis of costs
Patient specific charges were reported by giving the mean charge and the 95% confidence intervals. Differences between mean values were compared using a one-way analysis of variance with Duncan's multiple range test to adjust the level of significance for the use of multiple comparisons. The Mann-Whitney test for non-parametric data was used for confirmation in some cases.

Indirect Costs
Indirect costs were not considered.

Currency
NHS Economic Evaluation Database (NHS EED)
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US dollars ($).

**Sensitivity analysis**
A sensitivity analysis was not performed.

**Estimated benefits used in the economic analysis**
Percutaneous dilatational tracheostomy was completed in 65 patients (100%). Intraoperative complications (none of which resulted in serious morbidity) occurred in 14 (22%) patients. Early postoperative complications occurred in 6 (9%) patients and 1 of these led to a patient death. Late postoperative complications were reported in 2 patients (3% of the total and 7% of those with tracheostomy tubes removed and available for follow up). Twenty patients (31%) died during hospitalisation and 5 (8%) died after discharge.

**Cost results**
The mean total charge for ST in the OR was $2,642 (95% confidence interval $2,513-2,772). The mean total charge for PDT in the OR with anaesthesia was $2,355 (95% confidence interval $2,266-2,442). This was cheaper than ST and the difference was statistically significant (P<0.01). The mean total charge for PDT in the ICU with anaesthesia was $1,396 (95% confidence interval $1,377-1,414). This was cheaper than both ST and PDT in the OR and the differences were statistically significant (P< 0.001) The mean total charge for PDT in the ICU without anaesthesia was $997 (95% confidence interval $976-1,018). This was cheaper than both ST and PDT in the OR and the differences are statistically significant (P<0.001).

**Synthesis of costs and benefits**
Costs and benefits were not combined. No attempt was made to compare benefits, but it was assumed without demonstration that PDT was at least as effective as ST.

**Authors' conclusions**
The study showed that PDT was a safe, rapid, cost-effective alternative to ST. The authors' also concluded that PDT could be performed at the bedside without the need to transport critically ill patients from the ICU environment.

**CRD Commentary**
Selection of comparators.

No comparator was used for outcomes. This deficiency prevented the study being a full economic evaluation. Although the authors assumed throughout that PDT was safer than ST because there was no need for the risky transportation of critically ill patients, they did not show that this was the case.

Validity of estimate of benefit:

This study did not use a valid measure of benefit because no comparator was used and an assumption was made that all completed procedures were satisfactory.

Validity of estimate of costs:

The authors stated that hospital charges were a surrogate for true hospital costs. This substitution is often made in the USA, but the costs may not be relevant to the UK. Data were collected over 19 months and it is possible that changes to hospital charges were made over this period, but no details were given on this. Data were presented on the time taken for each procedure, which affected costs, but not on any other resource use. It was not reported whether there were any differences in after care between PDT and ST, which may have led to different use of resources.

**Other Issues:**
The authors did not state a protocol used for performing a tracheostomy, yet they did state, "The indications for and timing of tracheostomy in mechanically ventilated patients continue to be debated and have yet to be widely agreed on". This and the issues raised above make it difficult to generalise from this study even though the authors' conclusions may well be correct.

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