Comparison of safety and cost of percutaneous versus surgical tracheostomy

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 different tracheostomy techniques for the management of long-term ventilator-dependent patients were considered in the study: traditional surgical tracheostomy (ST), performed in the operating theatre using an open technique, and bedside percutaneous dilatational tracheostomy (PDT).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised long-term ventilator-dependent patients.

Setting
The setting was hospital. The economic study was carried out at the University of Virginia Medical Centre, Charlottesville, Virginia, USA.

Dates to which data relate
Effectiveness evidence and resource use data were gathered starting from 26 December 1996 for 23 months, until 11 November 1998. The price year was not reported.

Source of effectiveness data
The effectiveness evidence was 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 analysis.

Study sample
Power calculations were not performed on the sample. A retrospective medical chart review was performed to identify all patients admitted to the University of Virginia Medical Centre and who underwent tracheostomy from 26 December 1996 to 11 November 1998. A total of 256 patients were identified and those whose financial accounts were still open or unresolved were excluded from the study. Overall, 213 patients underwent tracheostomy: 74 patients were in the PDT group (mean age 57.7 years (range: 19-82 years)) and 139 patients in the ST group (mean age 47.5 years (range: 14-85 years)). There were 43 male patients in the PDT group and 74 in the ST group,
Study design
The study was a retrospective observational study, carried out in a single centre. The length of follow-up was not reported.

Analysis of effectiveness
All patients included in the study were accounted for in the analysis, indicating that the analysis was based on intention to treat. The primary health outcomes used in the analysis were the number of major and minor complications and the operation time. Patient groups were stated to have been similar in terms of age, sex, diagnosis, and number of days intubated before the procedure.

Effectiveness results
The effectiveness results were as follows:

The average operation time was 20 minutes in the PDT group and 36 minutes in the ST group.

Eight major complications were reported in the study: five (6.8%) in the PDT group and 3 (2.2%) in the ST group.

Among minor complications, the PDT option resulted in bleeding (2.7% of patients) and desaturation/cuff leak (1.4%) and poor position requiring tube change (1.4%).

In the ST group, only bleeding was reported (0.7%).

Clinical conclusions
The effectiveness analysis indicated that the complication rate was higher in the PDT group compared to the ST group. However, operation time was shorter in the PDT group.

Measure of benefits used in the economic analysis
Health outcomes were left disaggregated and no summary benefit was used, therefore a cost-effectiveness analysis was conducted.

Direct costs
Discounting was not relevant due to the short time horizon of the analysis. Resource quantities were not reported separately, but unit costs were given. The analysis focussed on both hospital costs and charges to calculate hospital savings. The total procedure charges included practitioners' fees, anaesthetists' fees (only for ST), inventory, operating room (only for ST), bronchoscopy and respiratory therapy (only for PDT). Total procedure costs included inventory, operating room (only for ST), and bronchoscopy and respiratory therapy (only for PDT). The estimation of costs was based on actual data obtained from the patient charts. Resource use data were gathered between December 1996 and November 1998. The price year was not reported.

Statistical analysis of costs
Statistical analysis of costs was reported but no details were given.

Indirect Costs
Indirect costs were not included.

Currency
US dollars ($).
Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
See effectiveness results above.

Cost results
Total costs were first calculated without the costs of managing complications.

In terms of charges, practitioners' fees were $800, inventory costs were $310.01, and bronchoscopy and respiratory therapy cost $570 and $73, respectively, in the PDT group.

Practitioners' fees amounted to $784, anaesthesia costs were $460, inventory costs were $125, and operating room costs were $1,267.50 in the ST group.

Total costs were $1,753.01 in the PDT group and $2,604 in the ST group, and the difference was statistically significant.

In terms of costs relevant to the hospital, total costs were $275 in the PDT group and $699 in the ST group.

When average costs of complications were included in the analysis, total costs of PDT rose to $5,691.41 for costs and to $11,382.82 for charges.

The cost of ST complications was not given.

Synthesis of costs and benefits
Not applicable.

Authors' conclusions
The authors concluded that PDT performed in the intensive care unit cost less than ST performed in the operating room and could be performed in less time. The adoption of PDT allowed the hospital to save more than the 50% of its costs. However, less major complications were associated with ST, thereby reducing the cost-effectiveness of PDT.

CRD COMMENTARY - Selection of comparators
The rationale for the selection of comparators was clear. ST and PDT were chosen because they represented the routine surgery intervention and a challenging new approach, respectively, for the management of long-term ventilator-dependent patients. You, as a user of this database, should consider whether they are commonly used technologies in your own setting.

Validity of estimate of measure of effectiveness
The internal validity of the study could have been reduced by the nature of the study design, which was retrospective and not randomised. Also, although the sample size was not small, a possible limit to the validity of the analysis was represented by the lack of statistical analyses to take into account potential biases and confounding factors. The possible risk of selection bias (high-risk patients more easily included in the ST group) was also not measured at baseline and no analyses were carried out to control for this. In fact the authors recognised at the outset that the possibility of selection bias existed towards the ST group having more complicated (difficult) cases. They did not, however, identify that this possibility, and the lower complication rate with the ST group suggests that ST was likely to be even safer. They also considered the possibility of a learning effect for the new procedure, although this would be difficult to disentangle
from the selection bias.

**Validity of estimate of measure of benefit**
Please refer to the "validity of measure of effectiveness" section, as there was no summary measure of benefit.

**Validity of estimate of costs**
It appeared that all categories of costs relevant to the perspective adopted (from both points of view: charges and pure costs) were included in the analysis. The cost estimates used in the study were somewhat specific to the authors’ institution. Only a few details relating to the resources used were reported and statistical analyses on quantities were not carried out. Furthermore, the price year was not indicated and complication costs for ST were not included.

**Other issues**
The generalisability of the results to other settings was limited given that sensitivity analyses were not performed and resource quantities were not reported. The authors made few comparisons of their results with those from other studies.

**Implications of the study**
The main implication of the study is that careful patient selection and additional experience with the procedure should be necessary, to ensure the cost-effectiveness of PDT over ST. However, this implies a generally positive slant on PDT, especially given its adoption at the authors’ institution. Unfortunately, although the costs of PDT were lower than ST, the study is very likely to be biased both in terms of effectiveness and cost, given that complication costs would probably rise for PDT were it not for the presence of selection bias.

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