Comparison of open versus bedside percutaneous dilatational tracheostomy in the cardiothoracic surgical patient: outcomes and financial analysis


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
Traditional tracheostomy (open) was compared with bedside percutaneous dilatational tracheostomies (PDT) in patients undergoing cardiothoracic surgery.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised cardiac surgical patients who required either open tracheostomy or bedside PDT.

Setting
The setting was tertiary care. The economic study was carried out in New York, USA.

Dates to which data relate
The effectiveness data and resources use data were gathered between May 1998 and June 2001. 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 sample of patients as that used in the effectiveness analysis.

Study sample
Power calculations were not reported. During a 3-year period, 86 tracheostomies (59 open and 27 PDT) were performed in more than 4,000 patients who underwent cardiac surgery.

Study design
This study was a retrospective analysis using the open group as a historical control. Patients who underwent cardiothoracic surgery at the New York Presbyterian Hospital-Weill Medical College of Cornell University required tracheostomy by the open technique during May 1998 to January 2000, and by PDT during January 2000 to June 2001.
The study period was 3 years. Operative data were collected and the postoperative course of the patient was followed for complications, length of stay (LOS) in the intensive care unit (ICU), total LOS, 30-day mortality and survival to discharge. Follow-up was 100% complete.

**Analysis of effectiveness**
The analysis of the clinical study was conducted on the basis of treatment completers only. The primary health outcomes used were the LOS in the ICU, the total LOS, the number of complications and the survival rate. The groups were shown to be comparable in terms of their demographics, medical histories, operative procedures and operative variables.

**Effectiveness results**
There were no significant differences in LOS between the groups. The LOS in the ICU was 53.7 (+/- 47.5) days for open tracheostomy and 43.0 (+/- 33.4) days for PDT. The total LOS was 60.9 (+/- 54.9) days for open tracheostomy and 45.1 (+/- 33.1) days for PDT.

The complication rate for arrhythmia was 70% in the open group and 44% in the PDT group, (p<0.03). Respiratory complications were 48% in the open group and 52% in the PDT group. The open and PDT groups had similar rates of haemorrhagic complications related to the cardiac surgical procedures, 46% versus 37%, respectively. The incidence of postoperative infections was 56% in the open group and 74% in the PDT group.

Thirty-day survival was 90% for open tracheostomy versus 82% for PDT, (p=0.89). Survival to discharge was 64% (open) and 63% (PDT), respectively.

**Clinical conclusions**
There were no significant clinical differences between open tracheostomy and PDT in cardiac surgery patients during the 3-year study period.

**Measure of benefits used in the economic analysis**
No summary measure of benefits was used. The study was, in effect, a cost-consequences analysis.

**Direct costs**
The direct costs included were for bronchoscopy, tracheostomy, medications used for PDT, operating room time, operating room medications and LOS. The estimation of the quantities and costs was based on assumptions, which followed directly from the authors’ experience with open tracheostomy and PDT. As the financial analysis was performed to project the potential cost-savings of PDT for a 5-year period, a discount rate of 15% was used. The price year was not reported.

**Statistical analysis of costs**
No statistical analysis of the costs was reported.

**Indirect Costs**
No indirect costs were reported.

**Currency**
US dollars ($).
Sensitivity analysis
A sensitivity analysis of critical economic variables was performed to evaluate the impact on cost-savings. The variables investigated were the average number of tracheostomies per year, the cost of operating room time per minute, and the cost of an ICU bed per day.

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

Cost results
The total savings associated with 1 year of PDT was $84,000 for a projected discounted savings of $283,000 during the study period. The net present value analysis, which discounted future savings by 15%, yielded a range of projected savings of PDT for more than 5 years of $73,000 to $541,000, with a best estimate of $304,000 using figures established from their 3-year experience with PDT.

A sensitivity analysis showed that the impact on the net present value of the economic variables was $227,000 per day for reduced LOS in the ICU, $180,000 per cost of operating room avoidance, $100,000 per ICU bed cost per day, and $11,000 per additional tracheostomy per year.

Synthesis of costs and benefits
The costs and benefits were not combined as the study was, in effect, a cost-consequences analysis.

Authors' conclusions
There were no significant clinical differences between open tracheostomy and bedside percutaneous dilatational tracheostomy (PDT) in cardiac surgery patients. However, the percutaneous technique offered significant cost-savings when assessed on a discounted cash flow basis for a 3-year period.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator was clear in that it reflected standard practice in the authors' setting.

Validity of estimate of measure of effectiveness
The study was based on a retrospective analysis, which may be prone to bias and confounding. Power calculations were not reported. The authors acknowledged that the short duration and small size of the study were major limitations. Blinding of the outcome assessment, which could reduce potential bias, was not reported. However, in an attempt to deal with some of these issues, the authors reported that statistical analyses were undertaken to account for potential biases and confounding factors.

Validity of estimate of measure of benefit
No summary measure of benefit was derived. The reader is therefore referred to the comments in the 'Validity of estimate of measure of effectiveness' field (above). The limitations of the study design (mentioned above) apply equally to this section.

Validity of estimate of costs
The authors did not state any cost perspective. The assumptions on quantities and costs in the model were based solely on the authors' experience. Discounting was carried out, which was appropriate as the cost-savings were projected for a 5-year period. The price year was not reported, which will present difficulties in terms of any future relflation exercises. A sensitivity analysis of the critical economic variables was performed. The authors acknowledged that, beyond the limitation of retrospective study, other departmental policy change would affect the financial analysis.
Other issues
The authors made appropriate comparisons of their findings with those from other studies, and the issue of
generalisability was addressed. The authors did not present their results selectively. The authors reported a number of
limitations to their study. For example, the retrospective approach, short duration and small size of the study sample,
and the fact that the scope of the study was limited to cardiothoracic patients.

Implications of the study
The authors did not make any recommendations. However, they implied that there is a need for a prospective study of
patients requiring postoperative tracheostomy and a more sophisticated modelling study.

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