Mechanical ventilation with or without daily changes of in-line suction catheters

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
Daily in-line suction catheter changes in patients requiring mechanical ventilation in intensive care setting.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Adult patients (older than 18 years of age) requiring mechanical ventilation for at least 12 hours in an ICU setting.

Setting
Hospital. The economic study was carried out in Missouri, USA.

Dates to which data relate
The effectiveness and resource use data were collected between March 1996 and July 1996. The fiscal year was 1996.

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

Link between effectiveness and cost data
The costing was prospectively performed on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations were used to determine the sample size (to obtain 80% power in order to be able to identify a 15% difference in the rate of ventilator-associated pneumonia between the two study groups with alpha-error of 5% (two tailed), 250 subjects were required in each study group). A total of 530 patients entered the study, of whom 9 were excluded and the rest were randomly assigned to receive either no routine in-line suction catheter changes (258 subjects) or daily in-line suction catheter changes (263 subjects). The average (SD) age of patients in the intervention group was 56.9 (19.7) years versus 58.2 (19.8) years, (P=0.43).

Study design
The study was a randomised controlled trial, carried out in a single centre. The duration of the follow-up was until discharge or death. The average duration of mechanical ventilation in the intervention group was 5.4 (8.4) days versus
5.7 (8.3) days in the control group. No loss to follow-up was reported. An infection control nurse, as an independent investigator, blinded to patients' group assignments prospectively reviewed all patients suspected of having ventilator-associated pneumonia.

**Analysis of effectiveness**
The analysis of effectiveness was based on intention to treat. The primary health outcomes were the rate of ventilator-associated pneumonia, hospital mortality, and mortality directly attributed to ventilator-associated pneumonia. The patients were shown to be comparable at baseline in terms of demographic and prognostic features. A multiple logistic regression analysis was used to investigate the impacts of all potential confounding variables on the primary outcomes of the study.

**Effectiveness results**
The rate of ventilator-associated pneumonia was 14.7% for the intervention group versus 14.8% for the control group (P=0.97). These rates were translated into 25.8 and 27.5 episodes of ventilator-associated pneumonia per 1,000 ventilator days, respectively, (P=0.79). The intervention group had a hospital mortality rate of 26% as opposed to 24.3% for the control group (P=0.67). The corresponding values for the rates of mortality directly attributed to ventilator-associated pneumonia were 1.9% and 1.5%, respectively, with a relative risk of 1.27 (95% CI: 0.35 to 4.69).

**Clinical conclusions**
The study demonstrated no statistically significant difference between the study groups in terms of the health outcomes measured. The authors reported that: "The findings of this investigation are consistent with recent studies showing the safety of not routinely changing ventilator circuits".

**Measure of benefits used in the economic analysis**
The rate of ventilator-associated pneumonia was used as the main benefit measure.

**Direct costs**
The resource quantities were reported separately from the costs. The cost analysis for in-line suction catheter changes was reported to include only the costs of materials and "not the time of the respiratory therapists". The perspective adopted in the cost analysis was not explicitly specified. The resource use and cost analysis were based on actual data. 1996 price data was used.

**Indirect Costs**
Not considered.

**Currency**
US dollars ($)

**Sensitivity analysis**
No sensitivity analysis was performed.

**Estimated benefits used in the economic analysis**
The rate of ventilator-associated pneumonia was 14.7% for the intervention group versus 14.8% for the control group (P=0.97). These rates were translated into 25.8 and 27.5 episodes of ventilator-associated pneumonia per 1,000 ventilator days, respectively, (P=0.79).
Cost results
The intervention group had a total cost of $837 (for a total of 93 catheter changes on the basis of a rate of $9 per change) versus $11,016 (for a total of 1,224 catheter changes).

Synthesis of costs and benefits
Costs and benefits were not combined since the intervention was regarded as the weakly dominant strategy.

Authors' conclusions
The authors concluded that the study "findings suggest that the elimination of routine in-line suction catheter changes is safe and can reduce the costs associated with providing mechanical ventilation".

CRD COMMENTARY - Selection of comparators
A justification was given for the choice of the comparator. It accorded with the recommendation of the largest manufacturer of in-line suction catheter system. You, as a database user, should consider whether this is a widely used health technology in your own setting.

Validity of estimate of measure of benefit
Despite a few technical limitations acknowledged by the authors, the estimates of effectiveness are likely to be internally valid due to the use of a randomised design. The sample size was determined by power calculations.

Validity of estimate of costs
Resource utilisation was not fully reported separately from the costs. Adequate detail of methods of cost estimation were not given. The study lacked a detailed presentation of the cost analysis performed.

Other issues
The issue of generalisability to other settings or countries was not fully addressed due to lack of sensitivity analysis and statistical analysis of the costs. It was acknowledged by the authors that the study results “are only relevant to institutions using closed-suction catheter system”.

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