Weekly ventilator circuit changes: a strategy to reduce costs without affecting pneumonia rates

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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
Mechanical ventilator circuits management.

Type of intervention
Primary prevention

Economic study type
Cost-effectiveness analysis.

Study population
Adult patients on mechanical ventilation.

Setting
Hospital. The economic study was conducted in Boston, Massachusetts, USA.

Dates to which data relate
Effectiveness and resource data were collected between November 1992 and November 1993. Price dates were not stated.

Source of effectiveness data
Single study.

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

Study sample
1708 patients in the control group (48-h circuit changes) and 1715 patients in the study group (1-week interval). Patients were subgrouped into: medical intensive care unit (ICU), medical non-ICU, surgical ICU, surgical non-ICU. A power calculation was conducted to determine the sample size.

Study design
Non-randomised trial with historical control. Single centre study. Duration of follow-up was 18 months. There was no loss to follow-up. The assessors of patients outcomes were blind to the study.
Analysis of effectiveness
The analysis of the clinical study was based on intention to treat. The primary health outcomes used in the analysis were ventilator-associated pneumonia rates. Comparability between groups was not addressed.

Effectiveness results
Ventilator-associated pneumonia rates were 9.64 per 1000 ventilator days (SE 0.98, 95% CI was 7.97-11.60) in the control group (48-h circuit changes) and 8.62 per 1000 ventilator days (SE 0.97, 95% CI 6.69 - 10.56) in the study group (1-week circuit changes). There were significantly greater odds of developing a ventilator-associated pneumonia in surgical patients (odds ratio 1.77, p= 0.02) and patients in critical care units (odds ratio 1.54, p= 0.005), but no significant risk of ventilator-associated pneumonia in patients with 1-week circuit changes (odds ratio 0.82, p= 0.22). The difference between the study and control groups (total patients and subgroups) was not statistically significant (p >0.05).

Clinical conclusions
There is no difference in ventilator-associated pneumonia rates with circuit changes at 48-h intervals versus weekly intervals.

Modelling
Logistic regression analysis was used.

Measure of benefits used in the economic analysis
Since the clinical study showed no difference in outcomes, the economic analysis was based on difference in costs only.

Direct costs
Health service costs were considered: materials, personnel.

Indirect Costs
Costs and quantities were reported separately. Quantities of resources were derived from the units of analysis (cases and controls), and costs of human resources were calculated using data from published studies. No price date was given.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
Not applicable.

Cost results
The total annual cost was $145,676.48 for 48-h circuit changes and $34,146.51 for 7-day circuit changes. Changing circuits at 7-day intervals resulted in a 76.6% ($111,530) reduction in the annual cost for materials and salaries.

Synthesis of costs and benefits
Authors’ conclusions
There is no difference in pneumonia rates with ventilator circuit changes at 48-h and 7-day intervals. Ventilator circuits can be safely changed at weekly intervals, resulting in large cost savings.

CRD Commentary
This study confirms the conclusions of previous studies related to ventilator-associated pneumonia. More details on the prices used would have been useful, but overall, a good, straightforward analysis. Several limitations of the clinical study have been outlined by the authors. The main limitation of the clinical study is that the issue of comparability between the intervention and comparator groups was not addressed.

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