Impact of patient position on the incidence of ventilator-associated pneumonia: a meta-analysis of randomized controlled trials
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CRD summary
The review concluded that patients positioned semi-recumbently 45° had a significantly lower incidence of clinically diagnosed ventilator-associated pneumonia compared with patients positioned supinely. The authors' conclusions did not reflect the level of statistical variation and uncertainty in the results, so caution is warranted when interpreting their conclusions and practice recommendations.

Authors' objectives
To determine the effect of position (prone and semi-recumbent 45°) of mechanically ventilated patients on the incidence of ventilator-associated pneumonia and other outcomes.

Searching
PubMed and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from inception to December 2007 for articles published in any language. Search terms were reported. Reference lists of selected papers were scanned.

Study selection
Randomised controlled trials (RCTs) that compared prone or semi-recumbent 45° with supine position in mechanically ventilated patients were eligible for inclusion. Trials had to report on the incidence of ventilator-associated pneumonia. Trials in paediatric patients were excluded.

The included trials studied semi-recumbent versus supine (lying on back) position, and prone (lying on front) position versus supine position in patients who required mechanical ventilation due to trauma, acute respiratory failure, or coma. The outcomes reported were ventilator-associated pneumonia, mortality, length of intensive-care unit stay, and duration of mechanical ventilation. Included trials were conducted in the UK, Europe and Mexico.

Two reviewers independently performed study selection.

Assessment of study quality
Two reviewers independently assessed trial quality using a modified Jadad 5-point scale using blinding, randomisation, withdrawals, and allocation concealment criteria.

Data extraction
Two reviewers independently extracted data on ventilator-associated pneumonia incidence, mortality, length of intensive-care unit stay and duration of mechanical ventilation. Data were used to calculate odds ratios (ORs) and mean differences, together with 95% confidence intervals (CIs).

Methods of synthesis
A fixed-effect meta-analysis was undertaken to calculate weighted mean differences (WMD) and pooled odds ratios, together with 95% confidence intervals. Random-effects meta-analysis was used when significant statistical heterogeneity was detected. Statistical heterogeneity was assessed using I² statistic and X² test.

Results of the review
Seven RCTs were included in the review (n=1,355 patients). Three trials assessed semi-recumbent versus supine position (n=337 patients), and four trials assessed prone position versus supine position (n=1,018 patients). Trial sizes ranged from 30 to 791 patients. The quality of the included trials was fair to good; six trials scored 3 out of 5 points on the Jadad scale and one trial scored 2 points.
Incidence of ventilator-associated pneumonia: Compared with patients positioned supinely, semi-recumbent patients had statistically significantly lower odds of developing ventilator-associated pneumonia (OR 0.47, 95% CI 0.27 to 0.82; I²=52%; χ²=0.12). When a random-effects model was used, the results were no longer statistically significant (OR 0.40, 95% CI 0.15 to 1.04). There was no statistically significant difference supine versus prone positioning groups for the incidence of ventilator-associated pneumonia.

Mortality: There was no statistically significant difference between supine versus prone positioning or semi-recumbent versus supine positioning on the odds of death.

Other outcomes: There was no statistically significant difference between supine versus prone positioning on the length of intensive-care unit stay or duration of mechanical ventilation.

Authors' conclusions
Patients positioned semi-recumbently 45° had significantly lower incidence of clinically diagnosed ventilator-associated pneumonia compared with patients positioned supinely. However, the incidence of clinically diagnosed ventilator-associated pneumonia among patients positioned pronoely did not differ significantly from patients positioned supinely.

CRD commentary
Inclusion criteria for the review were clearly defined. Two relevant databases were searched with no language restrictions. Publication bias was not assessed and could not be ruled out. Attempts were made to reduce reviewer error and bias throughout the review process.

Quality assessment was undertaken using a standard checklist, which indicated the generally fair to good quality of included trials. Trials were pooled using fixed-effects meta-analysis and statistical heterogeneity was assessed. There was evidence of moderate statistical heterogeneity in the main analysis of ventilator-associated pneumonia incidence, which was the only statistically significant result. When random-effects meta-analysis was undertaken on ventilator-associated pneumonia incidence, the results were no longer statistically significant.

The authors acknowledged that the results of the review were only statistically significant using fixed-effect modelling, which may not be valid due to the level of statistical heterogeneity, but they did not reflect this uncertainty in their overall conclusions; therefore, caution is warranted when interpreting their conclusions and practice recommendations.

Implications of the review for practice and research
Practice: The authors stated that the routine use of semi-recumbent 45° positioning in mechanically ventilated patients should become the standard of care in intensive-care settings.

Research: The authors stated that two ongoing clinical trials of ventilator-associated pneumonia will add to the evidence base.

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