Use of body positioning in the mechanically ventilated patient with acute respiratory failure: application of Sackett's rules of evidence

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Authors' objectives
To assess the effectiveness of body-positioning to improve oxygenation in the mechanically ventilated patient with acute respiratory failure (ARF).

Searching
The author searched the MEDLINE electronic database (1988 - October 1998), CINAHL and EMBASE for English language publications. The author searched:

1. MEDLINE using the keywords 'posture' and 'respiration- artificial' and ('respiratory-insufficiency' or 'respiratory-distress-syndrome').

2. CINAHL using the keywords ('patient-positioning' or 'posture') and 'ventilation-mechanical' and 'respiratory-failure'.

3. EMBASE using the keywords 'body-position' and 'artificial- ventilation' and 'respiratory-failure'.

The author also scanned the bibliographies of each included articles for additional relevant studies.

Study selection
Study designs of evaluations included in the review
All studies that involved intubated and ventilated patients with ARF or ARDS.

Specific interventions included in the review
The intervention of body positioning (semi-recumbent, side lying and prone positions) was included in the review. Studies of continuous turning or 'kinetic therapy' were excluded unless these were used to make comparisons with other body positions.

Participants included in the review
Ventilated patients with acute respiratory failure (ARF). Studies on the effects of body position in neonates were excluded.

Outcomes assessed in the review
Increases in oxygenation in patients with ARF.

How were decisions on the relevance of primary studies made?
The author does not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The author used Sackett's (1989, see Other Publications of Related Interest) to grade the quality of the included studies and used those grades to classify the levels of recommendations made in the conclusions of the review. The author does not state how the papers were assessed for quality, or how many of the reviewers performed the quality assessment.

Data extraction
The author does not state who, or how many reviewers, performed the data extraction. Data were extracted for the
categories of study identification, participant characteristics, diagnoses of participants, mechanical ventilatory support used, arousal used, positioning procedure used, duration of positioning, and outcomes (risks and benefits).

**Methods of synthesis**

How were the studies combined?
The studies were combined in a narrative summary of the risks and benefits of each body position reviewed.

How were differences between studies investigated?
The author does not state how differences between the studies were investigated.

**Results of the review**

In the evidence group for the semi-recumbent position there was only 1 level V trial with 16 participants.

In the evidence group for the side lying position there were 7 trials with 58 participants (2 level I trials (22 participants); 1 level II trial (10 participants); and 4 level V trials (26 participants).

In the evidence group for the prone position there were 12 trials (all level V) with 160 participants.

Results for the semi-recumbent position were that there were no statistical differences in arterial oxygen tensions or the ratio of arterial oxygen tension to fraction of inspired oxygen. Further, both static and dynamic compliance of the respiratory system were shown to be significantly lower in the semi-recumbent position compared with the supine position.

Results for the side-lying position found evidence (1 Level I study) of improved oxygenation following side lying, with the diseased lung superior, in ventilated patients with ARF secondary to unilateral lung disease. All other levels of research evidence consistently demonstrated an improvement in oxygenation in this position when there was unilateral lung involvement (Grade A). In ventilated patients with ARF and who had moderate right ventricular dysfunction, side lying can be associated with haemodynamic risks. Level I evidence exists for increased cardiac work in left side lying and decreased preload in right side lying. This is particularly important in patients at risk of cardiac compromise. No evidence exists to support increased oxygenation or other benefits from side lying in patients with ARF secondary to bilateral lung disease.

Results for the prone position found evidence that when all the studies are taken into consideration, the duration of prone positioning appears to have had a significant influence on the incidence of positive responses. Based on the existing evidence, the use of prone positioning for mechanically ventilated patients with ARF is supported by a Grade C recommendation. Improved oxygenation has been documented in mostly Level V research evidence, with minimal or no fatal risks associated with prone positioning.

**Authors' conclusions**

The author states the conclusions in four recommendation statements:

1. The use of side lying is recommended for improving oxygenation in ARF patients with unilateral lung involvement (Grade A). The affected lung should be superior. However, side lying is associated with certain haemodynamic risks, especially in patients with moderate right ventricular dysfunction.

2. The prone position is recommended for improving oxygenation in ventilated patients with ARF, especially ARDS (Grade C). The prone position is associated with minimal risks and no residual complications.

3. There is, at present, only one piece of Level V evidence to suggest that the semi-recumbent position would not improve oxygenation in ARF.

4. There is no direct evidence to support the upright position and thus no clinical recommendation can be made for ARF patients. While the benefits of the upright position are widely accepted in spontaneously breathing and healthy
subjects, there is a lack of research in critically ill patients with ARF. Haemodynamic stability may be a factor to consider in these patients.

**CRD commentary**

The author has clearly stated the research question and the inclusion and exclusion criteria. The literature search is very good but the author may have missed additional relevant studies by restricting the search to English language publications.

The quality of the included studies was not formally assessed but the author used Sackett's rules of evidence in grading the studies included in the review and has discussed the limitations of the review. The author has not reported on how the articles were selected, or how many of the reviewers were involved in the process of data extraction.

The data extraction is reported in tables and text and the narrative review was appropriate since there was no basis for a statistical pooling of the data.

Although no formal tests for homogeneity were reported the author has discussed the quality of the data and the effects of differences between studies on the outcomes of the review. The conclusions appear to follow from the results but should be viewed with caution because of the stated methodological limitations of the review.

**Implications of the review for practice and research**

**Practice:** The author did not state any implications for practice.

**Research:** The author stated that there is a need for prospective randomised clinical trials directly comparing the prone and other positions, as well as investigating the optimum duration and frequency of body positioning.

**Funding**

Lee Foundation.

**Bibliographic details**


**Other publications of related interest**


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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.