Evidence-based nursing interventions and guidelines for prone positioning of adult, ventilated patients: a systematic review

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CRD summary
This review appeared to conclude that there were benefits associated with prone positioning of ventilated patients, but that further research was needed. Poor reporting made it difficult to know whether the review process and synthesis were appropriate, which raised serious concerns about the reliability of the authors' conclusions and the recommendations suggested.

Authors' objectives
To explore and describe the evidence in support of beneficial nursing interventions during prone positioning of ventilated patients.

Searching
English language studies were identified through a computerised bibliographic search of MEDLINE, Cochrane Controlled Trials Register, ProQuest, EBSCOhost and CINAHL. The Internet was browsed and citation and manual searches undertaken.

Study selection
Randomised controlled trials (RCTs), comparative studies, non-randomised studies and observational studies in adult or paediatric patients who were ventilated and turned in the prone position were eligible for inclusion. Studies that included neonates were excluded. Of the included studies, participants had a mean age of 49.7 years. Patients presented with primary acute respiratory distress syndrome (59 per cent) and with secondary acute respiratory distress syndrome (49 per cent). The main outcomes appeared to be ventilation strategies, prone protocols, responder and non-responder groups, mortality, prone complications, responder outcomes (if patients met oxygenation improvement criteria), overall oxygenation outcomes and haemodynamic outcomes.

The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The quality of randomised controlled trials (RCTs) was assessed using the Jadad scale, which assessed randomisation, blinding, withdrawals and drop-outs (maximum score of 5). A Jadad score of 3 or more was considered good quality. All studies were rated according to the Oxford Centre for Evidence Based Medicine and were assigned grades where A was considered good quality and D poor quality. The authors did not state how many reviewers performed the validity assessment.

Data extraction
For RCTs, data on numbers of events in each group were used to derive the odds ratio (OR) and 95% confidence intervals (CIs) for dichotomous outcomes. Means with standard deviations were used for continuous variables. The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Methods of synthesis
For RCTs, meta-analysis was conducted to obtain pooled WMDs and 95% CIs. Statistical heterogeneity was assessed using the x2 test; where significant, a random-effects model was used. For other study designs, data were presented in a narrative synthesis.

Subgroup analyses were conducted to test the influence of different protocols of prone positioning including: responders and non-responders; volume-controlled and pressure controlled ventilation; prone position with support under the chest and pelvis or without support; time in prone position; number of turns from supine to prone position; number of personnel involved in the process; and whether prone-positioned patients were both sedated and paralysed or
Results of the review
Forty five studies (n=2,148) were included in the review: 42 studies in adult populations; and three studies in paediatric populations. Thirteen of the included studies were RCTs. The remaining 32 studies were of varied design including crossover trials, cohorts and case-series studies. Eighteen studies were considered A grade, 20 B grade and 3 C grade. Of the included RCTs eight trials scored less than 3 and five trials scored 3 on the Jadad scale.

Haemodynamic parameters
Pulmonary artery wedge pressure was improved significantly in patients turned from supine to prone position: between 10.5 mmHg and 22 mmHg in the supine position; and between 13.4 mmHg and 24.4 mmHg in the prone position (WMD 2.94 mmHg, p=0.0009; four studies).

Oxygenation
Prone position significantly improved PaO2 (partial pressure of oxygen in arterial blood) and PaO2/FiO2 ratio (partial pressure of oxygen in arterial blood as a fraction of inspired oxygen) (WMD 21.58 (95%CI: 11.36, 31.80) p<0.0001; four RCTs).

Other outcomes
Nineteen studies classified patients into responder (25 per cent) and non-responder (75 per cent) to prone position. The most common complications that occurred in the prone position were decrease in pulse oximetry (28 per cent), new pressure sores (26 per cent), bradycardia (10 per cent), cardiac arrest (10 per cent) and decreased blood pressure (10 per cent). There were non-significant increases in heart rate (WMD = 3.06 bpm) in patients who were both sedated and paralysed, compared with patients who were sedated only. Length of stay in intensive care was not significantly longer in prone patients compared with supine patients.

Authors’ conclusions
The authors’ conclusion appeared to be that there were benefits associated with prone positioning of ventilated patients. The authors recommended further research addressing nursing actions and outcomes regarding patients in the prone position.

CRD commentary
This review addressed a clear question in terms of participants, but the criteria for eligible interventions were not clearly defined (particularly with regard to interventions in control groups) and no inclusion criteria were mentioned for study design or outcomes. A reasonable search for relevant trials was undertaken, but search terms were not reported. The potential influence of publication bias was not considered in the report. Limited attempts were made to locate unpublished material.

It was unclear whether steps were taken to minimise the risk of error and bias in the processes of study selection, data extraction and validity assessment. Study validity was only assessed for RCTs and study quality was not used in the interpretation of findings. Moreover, study details were not provided, preventing evaluation of the reliability of their findings.

Because outcomes were not pre-specified and confidence intervals and p-values were not provided for all outcomes, interpretation of the results was difficult. Sub-group analysis was planned, however, data were not presented for all planned analyses. The authors made several practice recommendations based on the evidence presented, but new data was also presented in the recommendations which was not discussed in the text, including mode of ventilation, tolerance to enteral feeding, complications that can occur when turning patient from supine to prone positions, and many more.

Poor reporting made it difficult to know whether the review process and synthesis were appropriate, which raised serious concerns about the reliability of the authors’ conclusions and the recommendations suggested.
Implications of the review for practice and research
Practice: The authors presented practice recommendations for assessment, planning, implementation and evaluation. These were extensive and reported in the paper.

Research: The authors stated that further research addressing nursing actions and outcomes for patients in prone position was needed.

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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.