The effects of position on oxygen saturation in acute stroke: a systematic review

Tyson S F, Nightingale P

CRD summary
This review assessed the effect of body position on oxygen saturation in acute stroke. The authors found strong evidence that position does not affect oxygen saturation in non-hypoxic patients without relevant co-morbidities and limited evidence favouring an upright position for patients with relevant co-morbidities. The lack of supporting data from individual studies make the reliability of the conclusions uncertain.

Authors' objectives
To assess the effect of body position on oxygen saturation in patients with acute stroke.

Searching
PREMEDLINE and MEDLINE (1966 to 2004), PsycINFO (1966 to 2004), EMBASE (1966 to 2004), CINAHL (1982 to 2004), PEDro (1980 to 2004), all EBM Reviews (Cochrane Database of Systematic Reviews, Cochrane Controlled Trials Register, DARE; up to Issue 1, 2004) and the Scottish Intercollegiate Guidelines Network website were searched for articles published in English; the search terms were reported. Reference lists in relevant reports were handsearched.

Study selection
Study designs of evaluations included in the review
Although inclusion criteria for the study design were not explicitly defined, it was clear from the search terms that the review focused on clinical trials. There were no minimum quality criteria. Three of the included studies were controlled clinical trials in which patients acted as their own control; one study compared stroke patients with acute medical controls.

Specific interventions included in the review
Although inclusion criteria for the interventions were not explicitly defined, it was clear from the review question that the review focused on studies of body position. The included studies tested several body positions including lying supine and/or lying on either side, high side-lying, sitting up in bed and sitting in a chair. Most studies clearly described the positions used. The duration of each position varied from 10 minutes to one hour.

Participants included in the review
Although inclusion criteria for the participants were not explicitly defined, it was clear from the review question that the review focused on studies of patients with acute stroke. All but one of the included studies excluded patients with relevant co-existing morbidities; one study included patients regardless of any medical history. All but one of the studies tested patients within 72 hours of the stroke; the other study tested patients within 7 days of stroke. Two of the studies described the severity of the stroke: one in terms of the MRC scale (less than two with weakness in the limbs) and the other in terms of the Oxford scale (less than or equal to 2).

Outcomes assessed in the review
Although inclusion criteria for the outcomes were not explicitly defined, it was clear from the review question that the review focused on studies that assessed oxygen saturation. All but one of the included studies measured oxygen saturation using pulse oximetry, but the criteria used to define a hypoxic event differed; the other study used blood gas analysis.

How were decisions on the relevance of primary studies made?
Two reviewers independently conducted searches and selected studies. Any disagreements were resolved by consensus.

Assessment of study quality
The studies were assessed using the following criteria described by the Scottish Intercollegiate Guidelines Network for the assessment of 'traditional' randomised controlled trials (RCTs): study question appropriate and clearly focused; random allocation to treatments; adequate allocation concealment; participants and investigators blinded; baseline comparability of the treatment groups; groups treated equally apart from the intervention being studied; all relevant outcomes measured in a standard, valid and reliable way; the percentage of individuals or clusters entered that were analysed; participants analysed according to treatments allocated; and results homogeneous between sites. The maximum possible score was 10 points. Studies scoring 0 to 3 were considered low quality, scores of 4 to 6 were considered moderate quality, and scores of 7 or more were considered high quality.

It appears likely that two reviewers independently assessed validity and resolved any disagreements through discussion, with the aid of a third reviewer where required.

Data extraction
Two reviewers independently extracted the data and resolved any disagreements through discussion, with the aid of a third reviewer where required. Methods of analysis and outcomes were extracted for each study.

Methods of synthesis
How were the studies combined?
The studies were combined in a narrative. The strength of the evidence from studies was classified, according to criteria described by Rydwik et al. (reference given), as:

- strong (consistent results in more than half of the high-quality studies),
- moderate (consistent results in one high-quality RCT and one or more moderate- or low-quality studies, or consistent results in more than half of the moderate-quality RCTs),
- limited or contradictory evidence (one RCT of any quality or contradictory results from several RCTs), or
- no evidence (no RCTs found).

How were differences between studies investigated?
Differences between the studies were discussed in the text, particularly with respect to study quality, outcomes measures, testing positions and patient selection criteria.

Results of the review
Four controlled trials (183 patients with acute stroke) were included: three RCTs (n=173) and one controlled clinical trial (10 cases).

The three RCTs were rated as high quality, with scores of 8 out of 10. The non-randomised study scored 3 and was rated as low quality. In two studies, about half of the patients were unable to complete the intervention but they appeared to be accounted for in the analysis. All of the studies used paired design but only one study used a paired analysis. None of the studies used a blinded assessor or analyst. Two studies used a power calculation: the minimum required sample size was estimated to be 12 to 30.

Patients with no relevant co-morbidities (three studies).

Two high-quality studies found no effect on oxygen saturation of different sitting or lying positions in patients without relevant co-morbidities.

Three high-quality studies and one poor-quality study reported no effect on oxygen saturation of different lying positions in patients without relevant co-morbidities.

Patients with respiratory co-morbidities (one study). One high-quality study reported that oxygen saturation was
improved by sitting in a chair but worsened by lying positions in patients with respiratory co-morbidity.

Authors’ conclusions
There was strong evidence that body position did not affect oxygen saturation in patients without hypoxia or relevant co-morbidities. There was limited evidence that patients with/or at risk of hypoxia should be positioned as upright as possible and avoid lying positions. Recommendations for further research were made.

CRD commentary
The review addressed a clear question that was defined in terms of the participants, intervention, outcomes and study design, but none of the inclusion criteria were explicitly defined. Several relevant databases were searched and some attempts were made to locate unpublished studies. Limiting the studies to those reported in English might have resulted in the omission of other relevant studies; the authors acknowledged the possibility of missing data. Two reviewers independently selected studies, extracted data and assessed study validity, thereby reducing the potential for reviewer bias and errors. Validity was assessed using specified criteria and the results of this assessment were reported. As the authors pointed out, the validity criteria were designed for RCTs with separate interventions and control groups and not for studies of paired design. They acknowledged that this means that the quality assessment may not be reliable.

Differences between the studies were discussed in detail. Given these differences, a narrative synthesis was appropriate and study quality was taken into account when summarising the evidence. Although the studies were in general of a high quality, there were some concerns about the methodological weaknesses, including the fact that the studies were generally small and were not analysed appropriately using a paired analysis. Findings from individual studies were reported without supporting data or levels of statistical significance, and this meant it was not possible to verify the findings reported in the review. This lack of supporting data from individual studies makes the reliability of the review conclusions uncertain.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that research is required to identify the most clinically important definition of hypoxia before undertaking further studies about the effects of interventions to prevent or treat hypoxia in patients with stroke. They further stated that future studies need to include patients with all co-morbidities (including cardiac and respiratory disease) and severity of stroke to determine the influence of these factors; use a paired design and analysis; and assess the long-term effects of constant positioning in preventing hypoxia after stroke.

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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.