Policies for endotracheal suctioning of patients receiving mechanical ventilation: a systematic review of randomized controlled trials

Niel-Weise B S, Snoeren R L, van den Broek P J

CRD summary
This review concluded that there is no difference in ventilator-associated pneumonia between open and closed endotracheal suctioning systems for mechanically ventilated patients, but the studies were of a low quality and neither open nor closed suctioning can be preferentially recommended. Overall, this was a well-conducted and clearly reported review, and the authors’ conclusions are likely to be reliable.

Authors' objectives
To compare the effects on ventilation-associated pneumonia (VAP) of open and closed tracheal suction systems, and to compare changing the in-line suction catheter every 24 hours with less frequent changing in patients undergoing mechanical ventilation in intensive care units (ICUs).

Searching
MEDLINE and the Cochrane Library were searched to February 2006 using the reported search terms. Studies published in English, French or German were eligible. In addition, the reference lists in identified studies were screened.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs), quasi-randomised trials, and systematic reviews or meta-analyses of RCTs or quasi-randomised trials were eligible for inclusion in the review. The review only included parallel-group RCTs.

Specific interventions included in the review
Studies that compared closed and open tracheal suctioning were eligible for inclusion. In closed suction interventions, suctioning of secretions involved closed multiple-use catheters routinely changed every 24 hours or not routinely changed. In most open suctioning interventions, patients were disconnected from the respiratory circuit. The review also compared no routine catheter change or routine changes every 48 hours versus routine catheter changes every 24 hours.

Participants included in the review
Studies of patients undergoing mechanical ventilation in ICUs were eligible for inclusion. The primary studies included medical, surgical (including neurosurgical, trauma and burns) and neonatal patients with a variety of underlying conditions and a predicted duration of ventilation of more than 24 to 48 hours.

Outcomes assessed in the review
Studies that assessed VAP as the primary outcome, provided sufficient data to calculate the risk of VAP, and defined pneumonia were eligible for inclusion. In most of the included studies, the diagnosis of pneumonia was based on radiological and clinical criteria; a minority of studies confirmed the diagnosis microbiologically.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected the studies. Any disagreements were resolved by discussion or with the aid of a third reviewer.

Assessment of study quality
Studies were assessed for allocation concealment, description of drop-outs and the use of intention-to-treat analysis. Two reviewers independently assessed validity. Any disagreements were resolved through discussion with a third reviewer.
Data extraction
Two reviewers independently extracted the data and compared results. Relative risks (RRs) with 95% confidence intervals (CIs) were calculated.

Methods of synthesis
How were the studies combined?
Data from statistically and clinically homogeneous studies were pooled in a random-effects meta-analysis. Pooled RRs of VAP were calculated, along with 95% CIs.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the chi-squared statistic. Clinical differences between the studies were discussed in the text.

Results of the review
Ten RCTs (n=2,003) were included.

The studies were generally of a low quality and reporting was poor. Two studies reported adequate allocation concealment, and two adequately described drop-outs. In 8 studies it was not clear if the analysis was based on intention-to-treat; 2 studies did not use intention-to-treat analysis.

There was no statistically significant difference in VAP between open and closed suctioning systems (RR 0.97, 95% CI: 0.78, 1.21; 8 studies, n=1,381); no statistically significant heterogeneity was observed (p=0.70). There was also no statistically significant difference between changing the in-line suction catheter every 24 hours and less frequent changing (RR 0.99, 95% CI: 0.66, 1.50; based on 1 study, n=521; the other study reported zero events).

Authors' conclusions
There was no difference in ventilator-associated pneumonia between open and closed endotracheal suctioning systems for mechanically ventilated patients, but the studies were of a low quality and they could not preferentially recommend either open or closed suctioning.

CRD commentary
The review addressed a clearly defined question. Limiting the search to publications listed in two databases raises the possibility of publication bias and might have resulted in the omission of other relevant studies. Some attempts were made to minimise language bias, though at least two papers were excluded because of language limitations. Validity was assessed using specified criteria and the results of this assessment. Methods were used to minimise reviewer error and bias in the study selection, validity assessment and data extraction processes. Statistical heterogeneity was assessed and the studies were appropriately pooled using meta-analysis. Study quality was taken into account when drawing conclusions. Overall, this was a well-conducted and clearly reported review, and the authors’ cautious conclusions are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that they do not recommend preferential use of either open or closed endotracheal suctioning systems. They recommended changing in-line closed suction catheters every 48 hours, with more frequent changes in cases of mechanical failure or soiling.

Research: The authors stated the need for large, good-quality RCTs to evaluate the effects of endotracheal suctioning regimens on mortality, VAP and cost-effectiveness, in order to define the optimal regimen. Future studies should use the same care of airways in all patients, define VAP, clearly define the end of the study protocol and include the frequency of suctioning in the treatment protocol.

Funding
Not stated.
Bibliographic details

PubMedID
17464911

DOI
10.1086/513726

Indexing Status
Subject indexing assigned by NLM

MeSH
Humans; Intensive Care Units; Intubation, Intratracheal /standards; Pneumonia, Ventilator-Associated /prevention & control; Practice Guidelines as Topic; Suction /standards; Ventilators, Mechanical /standards

AccessionNumber
12007002098

Date bibliographic record published
01/04/2008

Date abstract record published
03/11/2008

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.