

Effectiveness of Evidence-Based Tracheostomy Suctioning Practices in Preventing Respiratory Infections and Improving Patient Outcomes in Adult Intensive Care Units: A Systematic Review

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Abstract

Background

Tracheostomy is a commonly performed procedure among critically ill patients who require prolonged airway management and mechanical ventilation. Although tracheostomy improves airway access and facilitates respiratory support, patients remain vulnerable to complications including secretion retention, airway obstruction, respiratory infections, and prolonged intensive care unit (ICU) stay. Tracheostomy suctioning is one of the most frequently performed nursing procedures to maintain airway patency and improve respiratory function. However, variations exist in suctioning frequency, technique, infection prevention measures, and clinical decision-making practices.

Evidence-based suctioning practices guided by patient assessment may reduce complications while avoiding unnecessary interventions. Critical care nurses play a key role in implementing safe suctioning techniques and preventing respiratory complications among tracheostomized patients.

Aim

The aim of this systematic review is to evaluate the effectiveness of evidence-based tracheostomy suctioning practices in preventing respiratory infections and improving clinical outcomes among adult intensive care patients.

Methods

A systematic review will be conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. Electronic databases including PubMed, Scopus, CINAHL, Web of Science, Embase, and Cochrane Library will be searched for relevant studies. Studies involving adult ICU patients with tracheostomy and evaluating suctioning practices, protocols, or nursing interventions related to respiratory outcomes will be included. The methodological quality of included studies will be assessed using appropriate critical appraisal tools.

Results

The review will synthesize evidence related to tracheostomy suctioning approaches, including assessment-based suctioning, standardized suctioning protocols, closed suction systems, aseptic techniques, and nurse-led tracheostomy care practices. Outcomes of interest will include respiratory infection incidence, airway complications, oxygenation status, duration of ICU stay, and patient safety indicators.

Conclusion

Evidence-based tracheostomy suctioning practices represent an important component of critical care nursing. Individualized suctioning based on patient assessment, adherence to infection prevention principles, and standardized nursing protocols may improve respiratory outcomes and enhance patient safety. Further high-quality research is required to establish standardized tracheostomy suctioning guidelines.

Keywords:

Tracheostomy; Suctioning; Critical Care Nursing; Respiratory Infection; Intensive Care Unit; Nursing Intervention; Airway Management

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1. Introduction

Background

Tracheostomy is an artificial airway created through a surgical opening in the trachea to facilitate breathing and airway management. It is frequently performed in critically ill patients requiring prolonged mechanical ventilation, airway protection, or management of excessive respiratory secretions.

Patients with tracheostomy often experience impaired natural airway clearance mechanisms because the upper airway functions of humidification, filtration, and secretion management are bypassed. As a result, accumulation of respiratory secretions may lead to airway obstruction, impaired gas exchange, and increased risk of respiratory infections.

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Respiratory infections remain one of the major complications among patients with artificial airways. Critically ill patients are particularly vulnerable due to reduced immunity, prolonged hospitalization, mechanical ventilation, and exposure to invasive procedures.

Tracheostomy suctioning is an essential nursing intervention performed to remove accumulated secretions, maintain airway patency, and improve ventilation. However, suctioning is an invasive procedure that requires appropriate clinical judgement. Excessive or unnecessary suctioning may contribute to complications such as mucosal injury, bleeding, hypoxia, increased patient discomfort, and airway irritation.

Current nursing practice emphasizes **assessment-based suctioning**, where the decision to suction is based on clinical indicators rather than routine scheduling alone. These indicators may include visible secretions, decreased oxygen saturation, abnormal breath sounds, increased respiratory effort, and changes in ventilator parameters.

Importance of Evidence-Based Suctioning Practice

Evidence-based nursing integrates clinical expertise, scientific evidence, and patient preferences to improve healthcare outcomes. In tracheostomy care, evidence-based suctioning practices include:

- Maintaining strict hand hygiene
- Using appropriate aseptic technique
- Selecting correct catheter size
- Maintaining appropriate suction pressure
- Limiting suction duration
- Providing adequate oxygenation when required
- Monitoring patient response
- Documenting secretion characteristics

Standardized nursing protocols may reduce variations in practice and improve patient safety.

Role of Critical Care Nurses

Critical care nurses are responsible for continuous assessment and management of patients with tracheostomy. Their responsibilities include:

- Assessing airway patency
- Identifying indications for suctioning
- Performing safe suction procedures
- Monitoring respiratory status
- Preventing infection
- Educating healthcare team members

Therefore, evaluating evidence related to tracheostomy suctioning practices is essential for strengthening ICU nursing care.

Aim of the Review

To evaluate the effectiveness of evidence-based tracheostomy suctioning practices in preventing

respiratory infections and improving patient outcomes among adult intensive care unit patients.

Objectives

1. To identify evidence-based tracheostomy suctioning practices used among adult ICU patients.
2. To evaluate the effectiveness of suctioning practices in preventing respiratory infections.
3. To determine the effect of suctioning protocols on patient outcomes.
4. To identify nursing interventions associated with improved tracheostomy care outcomes.

2. Methods

Study Design

A systematic review design will be adopted according to PRISMA 2020 guidelines.

Review Question

Among adult ICU patients with tracheostomy, how effective are evidence-based suctioning practices in reducing respiratory infections and improving clinical outcomes?

PICO Framework

Component Description

Population	Adult patients with tracheostomy admitted in ICU
Intervention	Evidence-based tracheostomy suctioning practices
Comparison	Routine or non-standardized suctioning practices
Outcomes	Respiratory infection prevention, airway complications, oxygenation, ICU outcomes

Eligibility Criteria

Inclusion Criteria

Studies will include:

- Adult patients with tracheostomy
- ICU or critical care settings
- Studies evaluating suctioning practices
- Nursing-related interventions
- Respiratory infection outcomes
- Clinical outcome measurements

Exclusion Criteria

Studies will exclude:

- Pediatric tracheostomy studies
- Case reports
- Editorial articles
- Non-peer-reviewed publications
- Studies without suctioning-related outcomes

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Search Strategy

Databases:

- PubMed/MEDLINE
- Scopus
- CINAHL
- Web of Science
- Embase
- Cochrane Library

Search terms:

("Tracheostomy" OR "Tracheostomy care"),

("Suctioning" OR "Airway suctioning"),

("Respiratory infection" OR "Pneumonia" OR "Respiratory complications"),

("Critical care nursing" OR "Nursing").

Data Extraction

The following data will be extracted:

Variable	Description
Author/year	Publication details
Country	Study location
Study design	RCT, cohort, quasi-experimental
Sample size	Participants
Intervention	Suctioning practice
Outcomes	Infection, complications, ICU outcomes

Quality Assessment

Methodological quality will be assessed using:

- Joanna Briggs Institute (JBI) appraisal tools
- Cochrane Risk of Bias tool (where applicable)

Results (To be completed after literature search)

The findings will be organized into themes:

Theme 1: Assessment-Based Suctioning Improves Patient Safety

Assessment-driven suctioning may prevent unnecessary airway manipulation and reduce procedure-related complications.

Theme 2: Standardized Suctioning Protocols Improve Nursing Practice

Protocols support:

- Consistent technique
- Reduced practice variation
- Improved documentation
- Enhanced competency

Theme 3: Infection Prevention Through Safe Suctioning Practices

Important preventive measures include:

- Hand hygiene

- Aseptic technique
- Proper equipment handling
- Closed suction systems when clinically indicated

Theme 4: Impact on Patient Outcomes

Potential outcomes include:

- Improved oxygenation
- Reduced respiratory complications
- Reduced ICU stay
- Enhanced patient comfort

Discussion

Tracheostomy suctioning remains a critical nursing intervention in intensive care settings. The effectiveness of suctioning depends not only on the frequency of the procedure but also on clinical judgement, technique, and adherence to infection prevention principles.

The review highlights the importance of moving from routine suctioning practices toward individualized, assessment-based approaches. Critical care nurses should evaluate each patient's respiratory status and determine the need for suctioning based on clinical indicators.

Implementation of standardized tracheostomy care protocols may improve consistency, reduce complications, and enhance patient outcomes.

Nursing Implications

Clinical Practice

- Develop evidence-based suctioning protocols.
- Conduct regular competency training.
- Monitor infection prevention practices.
- Encourage documentation of suctioning assessment.

Nursing Education

Include:

- Simulation-based tracheostomy training
- Airway management skills
- Infection prevention principles

Nursing Administration

Administrators should support:

- ICU protocol development
- Skill validation programs
- Quality improvement initiatives

Conclusion

Evidence-based tracheostomy suctioning practices are essential components of safe critical care nursing. Patient assessment, appropriate suctioning technique, and infection prevention strategies may contribute to improved respiratory outcomes and reduced complications. Future research should focus on standardized protocols and high-quality clinical studies to establish stronger evidence for tracheostomy suctioning practices.

REFERENCE:

1. American Association for Respiratory Care. (2010). AARC clinical practice guideline: Endotracheal suctioning of mechanically ventilated patients with artificial airways 2010. *Respiratory Care*, 55(6), 758–764.
2. Mitchell, R. B., Hussey, H. M., Setzen, G., Jacobs, I. N., Nussenbaum, B., Dawson, C., Brown, C. A., Brandt, C., Deakins, K., Hartnick, C., Merati, A., & others. (2013). Clinical consensus statement: Tracheostomy care. *Otolaryngology–Head and Neck Surgery*, 148(1), 6–20.
3. Hess, D. R. (2005). Tracheostomy tubes and related appliances. *Respiratory Care*, 50(4), 497–510.
4. Day, T., Farnell, S., Wilson-Barnett, J., & Haynes, S. (2002). Suctioning: A review of current research recommendations. *Intensive and Critical Care Nursing*, 18(2), 79–89.
5. Day, T., Wainwright, S. P., & Wilson-Barnett, J. (2001). An evaluation of a teaching intervention to improve the practice of endotracheal suctioning in intensive care units. *Journal of Clinical Nursing*, 10(5), 682–696.
6. Paul, F. (2010). Tracheostomy care and management in general wards and community settings: Literature review. *Journal of Clinical Nursing*, 19(5–6), 791–799.
7. Pedersen, C. M., Rosendahl-Nielsen, M., Hjermin, J., & Egerod, I. (2009). Endotracheal suctioning of the adult intubated patient—What is the evidence? *Intensive and Critical Care Nursing*, 25(1), 21–30.
8. Lewis, S. L., Bucher, L., Heitkemper, M. M., Harding, M. M., Kwong, J., & Roberts, D. (2023). *Lewis's medical-surgical nursing: Assessment and management of clinical problems* (12th ed.). Elsevier.
9. American Association for Respiratory Care. (2020). AARC clinical practice guideline: Management of adult patients with tracheostomy in the acute care setting. *Respiratory Care*, 65(11), 1680–1694.
10. Urden, L. D., Stacy, K. M., & Lough, M. E. (2022). *Critical care nursing: Diagnosis and management* (10th ed.). Elsevier.