PROCEDURE

4 Endotracheal Tube Care and Oral Care Practices for Ventilated and Non-ventilated Patients

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PURPOSE: Endotracheal tube (ETT) management and oral care are performed to prevent buccal, oropharyngeal, and tracheal trauma from the tube and cuff; to provide oral hygiene; to promote ventilation; and to decrease the risk of ventilator-associated pneumonia (VAP) and hospital-acquired pneumonia.

PREREQUISITE NURSING KNOWLEDGE

- Anatomy and physiology of the pulmonary system should be understood.
- ETTs are used to maintain a patent airway or to facilitate mechanical ventilation. The presence of artificial airways, especially ETTs, prevents effective coughing and secretion removal, necessitating periodic removal of pulmonary secretions with suctioning; serves as a direct portal for microorganisms; and significantly increases the risk for pneumonia. They also increase the risk for the development of VAP.[22,31,56]
- Suctioning of airways should be performed only for clinical indications and not as a routine fixed-schedule treatment (see Procedure 10). In acute-care situations, suctioning is performed as a sterile procedure to prevent healthcare-acquired pneumonia.[55]
- Adequate systemic hydration and supplemental humidification of inspired gases assist in thinning secretions for easier aspiration from airways.[31,57] The oropharynx and the upper gastrointestinal tract are the main reservoirs for pathogens associated with VAP and hospital-acquired pneumonia (HAP). Micro aspiration of this oral bacteria can result in VAP and HAP.[16,18,19,31,42]
- Appropriate cuff management (see Procedure 13) helps prevent major aspirations of pulmonary secretions, prepares for tracheal extubation, and decreases the risk of iatrogenic infections.[31]
- Constant pressure from the ETT on the mouth or nose can cause skin breakdown.
- If the patient is anxious or uncooperative, use of two caregivers for retaping and/or repositioning the ETTs may help prevent accidental dislodgment of the tube.
- VAP and HAP increase not only ventilator and intensive care unit (ICU) days and hospital length of stay, but also overall morbidity and mortality of the patient.[3,10,31,39,64]
- Oral hygiene:
  - Anatomy and physiology of the oral cavity and the importance of evidence-based oral hygiene procedures on a regular basis should be understood.[4,17,18,20,34,53,60]
  - The oral cavity is a significant source of bacterial colonization. Within 48 hours of admission to the hospital, the normal oral flora changes to include respiratory pathogens not normally found in healthy individuals.[24]
  - Salivary flow is a natural host defense in facilitating the removal of plaque and microorganisms. The major immune factor in saliva is immunoglobulin A (IgA). Its role is to protect the upper airway by limiting the absorption and penetration of microorganisms.[18]
  - Mechanical ventilation often promotes dry mouth or reduced salivary flow, contributing to plaque accumulation and decreased production of salivary immune factors.[11]
  - Certain medications as well as withholding food and oral fluids may also contribute to dry mouth in all patients, including those not on a ventilator.
  - The equipment used to remove oral secretions as well as suctioning of the ETT may contribute to the colonization of the oral cavity.[5,52]
- Oral care practices for ventilator patients:
  - Tooth brushing is an essential component of an effective oral care program; however, evidence related to prevention of VAP is not conclusive.[1]
  - Foam swabs are limited in their ability to remove plaque from sheltered areas or between teeth. Brushing is able to clean the proximal sites and crevices.[43]

- Mouthwashes while having beneficial antibacterial properties, frequently contain alcohol which can dry the oral tissues.[18]
- Use of chlorhexidine oral rinse (CHG) twice daily should be part of a comprehensive oral care program for ventilated patients to reduce the incidence of VAP.[33,50]
- Effect of povidone-iodine as an oral cleanser to reduce VAP remains unclear.[33]
- Oral care given every 2 to 4 hours appears to provide a greater improvement in oral health. If oral care is not provided for 4 to 6 hours, previous benefits are thought to be lost.[13]

- Oral care practices for non-ventilated patients:
  - Patients not on a ventilator are still at risk for pneumonia, and studies indicate that oral care can reduce this risk. Currently, non-ventilator HAP occurs more often than VAP, with similar mortality rates, costing more lives and dollars than VAP.[10]
  - Brushing teeth after each meal and a weekly review by a dentist or hygienist can reduce the incidence of pneumonia in elderly patients, resulting in fewer days with fever and lower mortality rates.[63]
  - Not only can enhanced oral care reduce pneumonia in nursing home residents, it may also improve swallow and cough reflex sensitivities, factors that could also help to prevent pneumonia.[62]
  - Increased frequency of oral care for non-ventilated adult patients in an acute-care hospital reduced non-ventilated HAP by 37% over 12 months.[45]
  - There are no documented studies that show the optimal frequency of oral care for non-ventilated patients. For the general public, the American Dental Association recommends brushing twice daily with a soft-bristled toothbrush using therapeutic toothpaste, and rinsing with an antiseptic rinse.[2]
  - If a non-ventilated patient cannot manage oral secretions and is at high risk for aspiration, the caregiver may consider using a suction toothbrush, similar to those used in the ventilated-patient setting.[46]

EQUIPMENT

- Goggles or glasses and mask
- Bite-block or oral airway if needed
- Adhesive or twill tape; commercial ETT holder (design must ensure ability to provide oral care and suctioning)
- 2 × 2 gauze or cotton swab for cleaning around the nares
- Normal saline solution
- Soft pediatric/adult toothbrush or suction toothbrush
- Foam oral swab or oral suction swab
- Oral cleansing solution (e.g., 1.5% H_2O_2,[7,18,28,38,49,51] chlorhexidine,[7,12,21,26,27,30,32,33,50,58,59] cetylpyridinium chloride,[7,37,48,56] toothpaste[13,29,32,43])

Additional equipment, to have available as needed, includes the following:

- Suction catheter for oral and nasal suctioning (single-use Yankauer, covered Yankauer, disposable oral saliva ejector)
- Two sources of suction or a bifurcated connection device attached to a single suction source
- Connecting tube(s) (4 to 6 feet)
- Nonsterile gloves
- Stethoscope

PATIENT AND FAMILY EDUCATION

- Explain the procedure to the patient and family, including the purpose of ETT care and the importance of comprehensive oral care in prevention of infection in both intubated and non-intubated patients.[1] ***Rationale:*** This step identifies patient and family knowledge deficits concerning patient condition, procedure, expected benefits, and potential risks and allows time for questions to clarify information and voice concerns. Explanations decrease patient anxiety and enhance cooperation.
- If indicated, explain the patient's role in assisting with ETT care. ***Rationale***: Eliciting the patient's cooperation assists with care.
- Explain that the patient will be unable to speak while the ETT is in place but that other means of communication will be provided. ***Rationale***: This information enhances patient and family understanding and decreases anxiety.
- Explain that the patient's hands may be immobilized to prevent accidental dislodgment of the tube. ***Rationale***: This information enhances patient and family understanding and decreases anxiety.

PATIENT ASSESSMENT AND PREPARATION

Patient Assessment

- Verify correct patient with two identifiers. ***Rationale***: Prior to performing a procedure, the nurse should ensure the correct identification of the patient for the intended intervention.
- Assess for signs and symptoms that indicate that oral cavity and ETT care is necessary. ***Rationale***: Assessment provides for early recognition that oral or ETT care is needed.
  - Excessive secretions (oral or tracheal)
  - Dry oral mucosa
  - Debris in the oral cavity
  - Plaque buildup on teeth
  - Soiled tape or ties or commercial device
  - Patient biting or kinking tube
  - Pressure areas on nares, corner of mouth, or tongue
  - ETT moving in and out of mouth
  - Patient able to verbalize or audible air leak around ETT
- Assess level of consciousness and level of anxiety. ***Rationale:*** This assessment determines the need for pain medication or sedation during ETT care and the number of care providers needed to perform the activities.

Patient Preparation

- Ensure that the patient understands preprocedural teachings. Answer questions as they arise and reinforce information as needed. ***Rationale***: This process evaluates

and reinforces understanding of previously taught information.

- Maintain the patient in a semi-Fowler's (≥30 degrees) position during mechanical ventilation to reduce the risk of aspiration.[15,31,59] Assist the patient to a high Fowler's (≥60 degrees) position or the most comfortable position for both the patient and nurse before performing the care. ***Rationale***: This position promotes comfort and reduces physical strain and maintains head of bed elevation to reduce risk of aspiration.[15,31,59]

Procedure for Endotracheal Tube and Oral Care for Ventilated Patients

Steps	Rationale	Special Considerations
1. HH		
2. PE		
3. Ensure that ETT is connected to the ventilator with a swivel adapter.	Decreases pressure exerted by ventilator tubing on the ETT, thereby minimizing risk of pressure ulceration.	
4. Support the ETT and tubing as needed.	Prevents inadvertent displacement or dislodgement of the tube.	If the patient is at risk for inadvertent or sudden movements, obtain an assistant to manually support the ETT and tubing.
5. If suctioning is clinically indicated,[55] hyperoxygenate via the ventilator before ETT suction and between attempts (see Procedure 10).	Removes secretions that may obstruct tube.	Suctioning of airways should be performed only for a clinical indication and not as a routine fixed-schedule treatment.[55]
6. If patient is nasally intubated, clean around ETT with saline solution–soaked gauze or cotton swabs.	Removes secretions that could cause pressure and subsequent skin breakdown.	The Society for Healthcare Epidemiology of America (SHEA) compendium and The Centers for Disease Control and Prevention (CDC) guidelines for prevention of VAP recommend that patients intubated nasally be reintubated orally as soon as possible to reduce the risk of VAP.[31,57]
7. If patient is intubated orally, remove bite-block or oropharyngeal airway (acting as bite-block) before proceeding with oral hygiene.	The bite-block or oropharyngeal airway prevents the patient from biting down on the ETT and occluding airflow.	The bite-block should be secured separately from the tube to prevent dislodgment of the ETT. The bite-block or ETT securing mechanism may be a barrier to providing good oral care.
8. Initiate oral hygiene with a pediatric or adult (soft) toothbrush, at least twice a day. Gently brush patient's teeth to clean and remove plaque from teeth. Suction oropharyngeal secretions after brushing. Use toothpaste or a cleansing solution that assists in the breakdown of debris **(Level C*)**.[4,9,23,25,28,35,45,54,58]	Mechanical cleansing and oral hygiene reduce oropharyngeal colonization and dental plaque, which is associated with VAP.[16,35,36,43,45,47,48] Toothpaste or cleansing solution should contain additives that assist in the breakdown of mucus in the mouth. Sodium bicarbonate assists in removal of debris accumulation on oral tissue and teeth.[18]	Pediatric or soft-bristle toothbrushes may be easier to use in adult intubated patients.[39,45,60]

*Level C: Qualitative studies, descriptive or correlational studies, integrative reviews, systematic reviews, or randomized controlled trials with inconsistent results.

Procedure for Endotracheal Tube and Oral Care for Ventilated Patients—*Continued*

Steps	Rationale	Special Considerations
9. In addition to brushing twice daily, use oral swabs with a 1.5% hydrogen peroxide solution to clean mouth every 2–4 hours.	Oral cleansing, suctioning, and moisturizing every 2–4 hours is a part of comprehensive oral care that has shown to improve oral health and reduce the risk of healthcare-acquired pneumonia.[13,18,45,49,51,54,58,60] Studies support the safety and efficacy of greater than 1% and less than 3% H_2O_2 as a cleanser for plaque removal and maintaining overall gingival health.[20,42,43]	Foam swabs are effective in stimulating mucosal tissue but less effective in plaque removal.[13,43]
10. Suction oropharyngeal secretions after cleansing. After each cleansing, apply a mouth moisturizer to the oral mucosa and lips to keep tissue moist. **(Level C*)**	Saliva serves a protective function. Mechanical ventilation causes drying of the oral mucosa, affecting salivary flow and contributing to mucositis and regions for bacterial deposits and growth.[18,39,44]	Implementation of a comprehensive oral care program is recommended by the CDC, SHEA, and the Institute for Health Care Improvement to reduce VAP.[27,31,57] Use of mouthwash as a cleansing agent is not recommended.[18]
11. Suction oral cavity and pharynx at a minimal frequency of every 4 hours.[54] **(Level C)** (Continuous subglottic suctioning: **Level A***) (Intermittent suctioning: **Level C**)	Removes secretions that may accumulate on top of the cuff and cause microaspiration.[8,49,54] Continuous subglottic suctioning with a specially designed ETT has been shown to reduce VAP.[31,41,60] Intermittent deep oral cleansing with a disposable or covered catheter as a part of a comprehensive oral care program has been shown to reduce VAP in a quality-improvement project.[18,28,49]	Oral suction equipment and suction tubing should be changed every 24 hours. Nondisposable, noncovered oral suction apparatus has been shown to be colonized with microorganisms present in the oral cavity.[52] Nondisposable oral suction apparatus should be rinsed with sterile isotonic sodium chloride solution after each use and placed on a paper towel if not disposable or covered.[18,49,52,63] Covered oral suction apparatus should be rinsed with sterile or distilled water and cover put back in place.[18,28,49,52] Placement of tonsil suction back into the package is associated with greater colonization.[18,39,52] Disconnection of a closed suction system to provide oral suctioning may contribute to increased bacterial colonization at the point of the disconnection.[18,39,52]

*Level A: Meta-analysis of quantitative studies or metasynthesis of qualitative studies with results that consistently support a specific action, intervention, or treatment (including systematic review of randomized controlled trials).
*Level C: Qualitative studies, descriptive or correlational studies, integrative reviews, systematic reviews, or randomized controlled trials with inconsistent results.

Procedure continues on following page

Procedure **for Endotracheal Tube and Oral Care for Ventilated Patients—*Continued***

Steps	Rationale	Special Considerations
12. Application of antiseptic oral rinses (chlorhexidine, cetylpyridinium chloride, added after brushing or done in conjunction with comprehensive oral care, can help reduce VAP.[33,50,58] **(Level B*)**	Twice a day application of 2% and 0.12% chlorhexidine gluconate to the oral cavity within a 2-hour time period from brushing has reduced VAP rates.[7,12,21,26,27,50,58] Cetylpyridinium chloride has been shown to be an effective solution in the removal of plaque and prevention of gingivitis.[7,37,48,55] Povidone-iodine effectiveness as a rinse to reduce VAP remains unclear.[33]	More frequent use of antiseptics than recommended may result in greater discoloration of the teeth.[18,37,47]
13. Move oral tube to the other side of the mouth. Replace bite-block or oropharyngeal airway (to act as bite-block) along the ETT if necessary to prevent biting. If deflation of the cuff is necessary to move from one side of the mouth to the other, deep oral suctioning should be performed before deflation. **(Level C*)**	Prevents or minimizes pressure areas on lips, tongue, and oral cavity. Deep oral suctioning above the cuff before deflation or position change can reduce the risk of colonized oral secretions being aspirated.[8,54]	
14. After oral hygiene is completed, change the ETT securing mechanism with new tape, ties, or commercial device, as needed, according to institutional standard (see Fig. 2-10). **(Level C)**	The securing mechanism should be changed if using tape and/or moved at least once daily to provide an opportunity for assessment and repositioning of the ETT to reduce the risk of a pressure skin injury. If the securing mechanism loosens, more frequent change may be necessary.[44,53] When tape was compared with commercially available devices, tape was superior to three of four devices in withstanding high external forces and was the most cost effective.[6,40]	If the method to secure the ETT obstructs the ability to provide effective oral care, consider changing the securement method.
15. Ensure proper cuff inflation (see Procedure 13).	Helps in preventing air leaks during ventilation and aspiration.	
16. Reconfirm tube placement (see Procedure 2), and note position of tube at teeth, gumline, or nares.	Common tube placement at the teeth is 21 cm for women and 23 cm for men.	
17. Remove PE and discard supplies.		
18. HH		

*Level B: Well-designed, controlled studies with results that consistently support a specific action, intervention, or treatment.
*Level C: Qualitative studies, descriptive or correlational studies, integrative reviews, systematic reviews, or randomized controlled trials with inconsistent results.

Procedure for Oral Care: Non-ventilated Patients

Steps	Rationale	Special Considerations
Independent Self-Care		
1. Instruct patient to brush gently for 1–2 minutes and swish with oral rinse. Moisturize lips and mouth as needed for dryness.	Promotes good oral hygiene.	Consider using the following tools: soft-bristled toothbrush, therapeutic toothpaste, alcohol-free antiseptic oral rinse, and non–petroleum-based moisturizer.[45,46]
2. Encourage brushing four times a day (i.e., after each meal and before bedtime).[45,46] **(Level C*)**	Promotes good oral hygiene.	
Dependent, Unable to Manage Own Oral Care or Secretions Safely		
1. HH		
2. PE		
3. Brush with a suction toothbrush and toothpaste or gel for 1–2 minutes, suctioning frequently.	Promotes good oral hygiene.	Consider using the following tools: suction toothbrush, therapeutic toothpaste or gel, alcohol-free antiseptic oral rinse, and non–petroleum-based moisturizer.
4. Remove PE and discard supplies.		
5. HH		
Edentulate Patients, Dentures		
1. HH		
2. PE		
3. If no teeth or dentures, gently brush gums, tongue four times a day (i.e., after each meal and before bedtime). If patient is allowed nothing by mouth or is on tube feedings, oral care can be performed every 6 hours. Apply antiseptic oral rinse with moistened swab and suction. Apply moisturizer with swab.[45,46] **(Level C)**	Promotes good oral hygiene.	Consider using the following tools: soft-bristled toothbrush, therapeutic toothpaste/gel, alcohol-free antiseptic oral rinse, and non–petroleum-based moisturizer.[45,46]
4. If patient is wearing dentures, soak at night in denture cleanser. During the daytime, rinse/swab with antiseptic rinse after each meal and apply moisturizer, prn.[45,46] **(Level C)**	Promotes good oral hygiene.	
5. Remove PE and discard supplies.		
6. HH		

*Level C: Qualitative studies, descriptive or correlational studies, integrative reviews, systematic reviews, or randomized controlled trials with inconsistent results.

Expected Outcomes

- Patent airway
- Secured ETT
- Removal of oral secretions
- Intact oral and nasal mucous membranes
- Reduced oral colonization
- Moist pink oral cavity

Unexpected Outcomes

- Dislodged ETT
- Occluded ETT
- ETT cuff leak
- Pressure ulcers in mouth or on the lip or nares
- VAP

Procedure continues on following page

Patient Monitoring and Care

Steps	Rationale	Reportable Conditions
		These conditions should be reported if they persist despite nursing interventions.
1. Keep head of bed elevated at least 30 degrees, unless contraindicated.[8,15,31,59,60] **(Level C*)**	Maintaining the head of the bed in an elevated position decreases the risk of aspiration. Contraindications include hemodynamic instability, decreased cerebral perfusion pressure, and patient in the prone position.	
2. Suction ETT if clinically indicated.	Maintains patent airway.	• Inability to pass suction catheter
3. Monitor amount, type, and color of secretions.	Monitors for signs of infection.	• Change in quantity or characteristics of secretions
4. If patient is nasally intubated, recommend reintubation in the oral cavity. **(Level C)**	Nasal intubation is associated with an increased risk for sinusitis and the potential development of VAP.[31]	• Purulent drainage from the nares or present in the back of the throat
5. Assess oral cavity and lips every 2 hours, and perform oral care (as outlined in **Steps 7–12**) every 2–4 hours and as needed. **(Level C)**	If oral care is omitted for an extended period, previous benefits are lost.[13,18,28,49,61] Early recognition of pressure or drainage allows for prompt intervention. Promotes good oral hygiene.	• Breakdown of lip, tongue, or oral cavity • Presence of mouth sores • Bleeding of the gums during brushing
6. For non-vented patients, assess oral cavity and lips every 2 hours and perform oral care outlined in **Steps 1–4** based on patient type. **(Level C)**		
7. With oral care, assess for buildup of plaque on teeth or potential infection related to oral abscess.	Assessment and removal of plaque decreases bacteria in the mouth.	• Continued plaque buildup on teeth, presence of an abscess
8. Avoid reusing devices unless covered or protected (i.e., in-line suction or covered Yankauer).	Apparatuses exposed to the oral cavity or secretions in the lungs when left unprotected within the environment have been shown to be colonized with bacteria in the oral cavity.[52]	
9. Reconfirm tube placement (see Procedure 2), and note position of tube at teeth or nares.	Ensures secured tube.	• Tube movement in and out of mouth
10. Retape or secure ETT every 24 hours and as needed for soiled or loose securing devices.		
11. With subglottic secretion drainage ETT in place, if tube becomes clogged irrigate with air per manufacturer's instructions but do not increase suction pressure beyond what is recommended by the manufacturer. **(Level M*)**	Damage to the tracheal mucosa was noted with the use of subglottic secretion drainage. In one study in patients whose ETT was clogged, patients were reintubated and their clogged tubes were examined. In 17 of 19 subglottic suction ports, the clogging was caused by tracheal mucosa versus secretions.[14] Consider routine irrigation with air to prevent clogging.	• Clogged subglottic suction port

*Level C: Qualitative studies, descriptive or correlational studies, integrative reviews, systematic reviews, or randomized controlled trials with inconsistent results.
*Level M: Manufacturer's recommendations only.

Documentation

Documentation should include the following:

- Patient and family education
- Patient tolerance to suctioning
- Aspirate amount, type, and color
- Presence of nasal drainage
- Repositioning of ETT and new position
- Retaping of ETT
- Oral care, moisturization, and oral suctioning
- Condition of lips, mouth, and tongue
- Absence of a cuff leak
- Pressure in the cuff (2–30 mm Hg)
- Centimeter mark on ETT and placement position in the oral cavity
- Which naris ETT is in

References and Additional Readings

For a complete list of references and additional readings for this procedure, scan this QR code with any freely available smartphone code reader app, or visit http://booksite.elsevier.com/9780323376624.

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