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Perspectives

Recovery Strategies from the OR to Home

Oral Care in the ICU: *Don't Forget to Brush*

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CONTINUING EDUCATION FOR NURSING

In This Issue

Oral care is an important component of intensive care nursing but is often given low priority when compared with other critical practices. Recent evidence indicates that colonization of the mouth with respiratory pathogens may contribute to ventilator-associated pneumonia (VAP). Oral care may be an important preventive measure against VAP and not merely a comfort measure. Pneumonia is the most common nosocomial infection in ICUs and significantly contributes to morbidity patterns and mortality among mechanically ventilated Oral care protocols have proved effective in reducing oropharyngeal colonization and pneumonia risks.

Catheter-associated urinary tract infections (CAUTI) is the most frequent nosocomial infection and comprises the largest reservoir of antibiotic-resistant pathogens in healthcare institutions. Despite evidence that CAUTIs can often be prevented, these infections remain among the most predominant healthcare-acquired infections in the US. Some organizations have adopted the practices advocated in evidence-based guidelines, and in this issue, Ms. Marshall describes a protocol that has successful reduced the incidence of CAUTI at her institution.

Imagine waking up and not brushing your teeth. Now, imagine this happening day after day. The hospitalized patient who is unable to provide self-hygiene depends on the healthcare professional to do just that: brush his or her teeth. Some nurses consider oral care to be comfort care,[1] and most nurses would not consider the lack of oral care life threatening. But is that the case?

A relationship exists between oral health and systemic disease. Inflammation of the oral cavity may impact the cardiac, respiratory, or endocrine systems and place pregnant patients at risk for premature birth and low birth weight.[2] Individuals with periodontitis (chronic bacterial infection of the oral tissues) have increased levels of proinflammatory mediators. Studies have shown that when periodontal treatment is performed, the serum levels of these inflammatory mediators decrease.[3] A Japanese study noted a decreased risk of pneumonia in nursing home residents who were provided with oral care; this protocol included sessions with hygienists and dentists.[4] Periodontal disease also affects glycemic control in diabetic patients. Diabetics experience a significantly higher prevalence of stroke, transient ischemic attack, myocardial infarction, and periodontal disease. In a longitudinal study of more than 600 individuals with diabetes and periodontal disease, the risk for death from ischemic heart disease and diabetic nephropathy was 3.2 times greater than in those without periodontal disease.[5] Perhaps it is time to partner with the dental community and provide interdisciplinary collaboration in both chronic and acute care settings.

> A relationship exists between oral health and systemic disease.

One of the requirements by the Omnibus Budget Reconciliation Act (OBRA) is to assess the oral heath of residents in long-term care facilities that receive Medicare or Medicaid funds.[6] By contrast, no specific requirement exists for acute care facilities, but recommendations by the Agency for Healthcare Research and Quality (AHRQ) for nursing management of oral hygiene are available. In acute care, assessment of the oropharynx may be difficult, especially in orally intubated patients, because the oral cavity has limited access

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Preventing Hospital-acquired Catheter-Associated Urinary Tract Infections: *Case Study*

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As part of the Deficit Reduction Act (DRG) of 2005, the secretary of Health and Human Services is required to identify conditions that 1) are high cost, high volume, or both; 2) result in a higher DRG payment due to a secondary diagnosis; and 3) could have reasonably been prevented through the use of evidence-based practice guidelines. Catheter-associated urinary tract infections (CAUTI) constitute one of the hospital-acquired conditions as defined by the Centers for Medicare and Medicaid Services (CMS).[1]

Urinary tract infections are the most common hospital-acquired infections, and up to 25% of hospitalized patients will have indwelling urinary catheters at some time during their hospital stays.[2,3] Indwelling urinary catheters cause 80% of hospital-acquired urinary tract infections.[4] The daily risk of urinary tract infection for patients with indwelling catheters ranges from 3% to 7%.[5] In addition to prolonged indwelling urinary catheter placement, the known risk factors that place patients at increased risk for developing CAUTI are female gender, increased age, catheter insertion outside the operating room, failure to maintain a closed drainage system, diabetes, malnutrition, and comorbid infections.[5] Tambyah discusses factors that reportedly place patients with indwelling catheters at risk for developing CAUTI, including history of urinary tract infections, compromised immune system, being nonambulatory, and history of indwelling catheters transferred from other institutions/levels of care.[6]

The best means of preventing hospital-acquired CAUTI is to limit urinary catheter use and decrease length of hospitalization in those patients who meet required indications for their use.[5,7] In a study by Saint and colleagues of medical teams that included students in 319 provider–patient observations, 28% were unaware of patients' catheterizations, and catheter use was inappropriate in 26 of 117 (31%) of patients.[8]

Financial Implications of CAUTI

Costs of treating symptomatic urinary tract infections have been estimated at $600 per episode, and the approximate costs associated with bacteremia as a result of urinary tract infections are as high as $3,000. One example of the financial impact of CAUTI on hospitals as described by Wald and Kramer stated that reimbursement for the care of a patient with an acute myocardial infarction (AMI) without comorbidity resulted in Medicare reimbursement of $5,436.66, whereas reimbursement for an identical patient with an AMI also treated for a urinary tract infection would be $6,721.44.[9] For a patient with AMI-acquired *Escherichia coli* bacteremia and sepsis, the reimbursement for care would be $8,905.43. Therefore, careful screening for risk factors and identification of the presence of existing urinary tract infections in patients on admission to inpatient settings is a crucial factor in a safe, effective, and efficient care environment for patients while also decreasing negative financial impact for healthcare organizations.

CAUTI Prevention Strategies

In 1981, the Centers for Disease Control (CDC) published guidelines for the prevention of CAUTI.[10] In 2001, the National Health Service (NHS) in the United Kingdom published guidelines for preventing CAUTI for short-term indwelling catheters in acute care environments and updated these guidelines in 2006.[11,12] These updated NHS guidelines recommend the following:

- Appropriate documentation of catheter insertion
- Catheter insertion by trained personnel
- Patient/family education
- Proper hand hygiene
- Evaluate necessity for catheter insertion and need for continuation
- Evaluate alternative methods of bladder drainage
- Use smallest possible gauge catheter
- Maintain aseptic technique and sterile equipment
- Use and maintain a closed drainage system
- Obtain urine samples aseptically
- Do not change catheter routinely
- Perform routine hygiene for meatal care
- Avoid bladder irrigation

Additional practice elements included in these guidelines either were not discussed or efficacy was unresolved when the CDC guidelines and NHS updates were compared. Those elements of the practice guidelines include:

- Selection of catheter material
- Barrier precautions during catheter insertion
- Antiseptic cleaning of urinary meatus
- Replacing urinary drainage system in cases of known occurrence in break in asepsis
- Cohorting patients
- Ensuring compliance with training
- Ensuring compliance with control measures
- Ensuring compliance with catheter removal
- Monitoring CAUTI rates and bacteremia

Following the implementation of these CMS changes, other guidelines and CAUTI prevention initiatives have been proposed and discussed in the scientific literature, and still others have been employed by some organizations and shared as "best practices" via list serves, Web and audio conferences, and anecdotal successes shared among colleagues on an informal basis. Of the policies and practice strategies that have been shared among colleagues, most include evidence of some or all of the CDC/NHS guidelines listed above. Though not specifically addressed in our organization's plan, the CDC strongly recommends Category IC—securing the catheter properly to prevent CAUTI.[13] Also, Newman presents a strong argument for securing urinary catheters to prevent dislodgement and leakage, provide stabilization, and avoid meatal trauma or irritation.[14] There is strong evidence that securing urinary catheters reduces infections, preventing the catheter from causing urethral trauma or leakage, and using a standard mechanism for securing the catheter is certainly an advisable intervention to include in guidelines for care of these patients. In developing the CAUTI Prevention Plan for our organization, best

available evidence from the literature, best practices from other organizations, and a "Plan, Do, Check, Act" Model for Performance Improvement were used to provide the foundation for these critical practice changes. Progress and patient outcomes are evaluated on a monthly basis. Though we do not yet have enough data to establish trends or patterns, our implementation experience with this initiative and lessons learned are represented in the following case study.

Case Study

Prior to the October 2008 implementation date for CMS reimbursement changes affecting patients with hospital-acquired conditions, the leadership team responsible for patient care quality educated clinical leaders about the upcoming changes related to "present on admission" and "hospital-acquired conditions" and identified team leaders for each condition. In the beginning, the teams met weekly with the director of quality to provide progress updates. During this period, a number of Web conferences were held for stakeholders, and materials developed by the Clinical Services Team from our corporate office were shared and made available for use by each organization throughout our system.

Two nurse leaders were assigned to lead the CAUTI prevention project. Although many elements were already in place for several of the other hospital-acquired conditions initiatives, few formal CAUTI prevention strategies had been implemented in our organization. Current CAUTI incidence was unavailable as a baseline metric because surveillance of hospital-acquired urinary tract infections had not been routinely performed. The Clinical Services Team from our parent corporation proposed a model for CAUTI prevention and provided education for stakeholders throughout the corporation. The team leaders for the CAUTI Prevention initiative also reviewed current literature and collected best practices to develop and implement the CAUTI Prevention Program in our organization. Upon thorough review of available resources, the team leaders implemented the following key program elements:

- Identification of intraprofessional team members to develop, implement, and evaluate the program
- Deployment of a CAUTI Prevention Plan (standards of care and policy statements)
- Development and implementation of an algorithm for insertion, continuation, and removal of indwelling urinary catheters
- Execution of a Daily Goals Sheet (including urinary catheter care bundle)
- Revisions to the electronic health record to better capture urinary catheter insertion, care, and removal
- CAUTI prevention education for nurses, physicians, and unlicensed assistive personnel
- Development and implementation of an audit tool to evaluate patient outcomes

> There is strong evidence that securing urinary catheters reduces infections, preventing the catheter from causing urethral trauma or leakage.

To effectively implement this important organizational change, the team leaders engaged an intraprofessional team that included representatives from the medical staff (a urologist, a hospitalist, and an infectious disease specialist), Information Technology and Services, Organizational Development, Finance, Hospital Information Management, Medical Library, and Hospital Supply Chain. In addition, the team leaders consulted with experts from Infection Prevention and Control as well as with the medical director for Emergency Services to seek guidance and engage them in deployment of the proposed CAUTI Prevention Plan. All individuals involved were in agreement with the proposed plan. The primary strategy aimed at reducing CAUTI was the reduction of indwelling catheter use in the organization combined with proactive decision making regarding criteria for catheter insertion, use, and removal and ongoing monitoring of catheter use in hospitalized patients.

The next step was the development, approval, and implementation of a CAUTI Prevention Plan that included purpose, policy, and procedure statements to guide clinicians in safely caring for patients. The policy statements required the following:

- Patients requiring urinary catheter insertion or continuation must meet specific criteria.
- Urinary catheter insertion and removal require an order from an approved prescriber.
- In patients with urinary catheters in place, daily assessments are required to determine the need for catheter continuation or removal.
- If patients are expected to require catheters for periods longer than 7 to 14 days, catheters coated with a silver alloy will be inserted.

Catheters will be changed in patients arriving at the hospital with indwelling urinary catheters in place unless there are contraindications for doing so.

Several key procedure statements include:

- Maintaining urinary drainage systems below the level of the patient's bladder at all times.
- Assessment of all patients seen in outpatient areas and the emergency department or admitted to inpatient units to determine whether the patient meets criteria for catheter insertion, continuation, or removal.
- If the patient is expected to require the catheter for more than 7 days, a silver alloy-coated catheter should be inserted.
- Catheters size French 16 or smaller should not be used unless ordered by the prescribing healthcare provider.
- When inserting catheters, the balloon may have to be overfilled (eg, with more than the amount stated on the label in order to reduce dead space, prevent balloon deformity, and improve performance).
- Use and maintain closed urinary drainage systems whenever possible. Do not irrigate or instill solutions unless specifically ordered to do so.

Among the many recommended CAUTI prevention strategies, limiting catheter use in hospitalized patients should be the primary element in every clinician's toolbox.

After the Prevention Plan was developed, the next step was to implement a decision tree or algorithm establishing criteria for insertion, continuation, and removal of indwelling urinary catheters. The team leaders educated multispecialty physicians and nurses regarding the indications for

catheter use in hospitalized patients, including:

- Instillation of medication/bladder irrigations required
- Lower urinary tract obstruction not manageable by other means
- Neurogenic bladder conditions when intermittent catheterization is not possible
- Need for obtaining meticulous I & O in critically ill patients (eg, septic shock, major trauma, cardiac/respiratory/renal failure, solid organ or stem cell transplantation, and others)
- In situations of diuresis or massive hydration
- To provide bladder drainage following urologic surgery or surgery to contiguous structures
- In cases when physician has ordered the catheter to be left in place secondary to difficult insertion or for other special purposes
- Managing incontinence in stage III-IV pressure ulcers
- Promoting comfort in palliative care situations

The healthcare team should carefully weigh the risks and evaluate the need to insert indwelling urinary catheters in hospitalized patients. After a urinary catheter is inserted, the team should assess the need to continue the catheter on a daily basis and remove the catheter once the patient fails to meet the criteria listed above.

In addition to the algorithm, our team also implemented a Daily Goals Sheet to guide the dialogue between team members in assessing on a daily basis whether the patient still meets criteria for maintaining the indwelling catheter and ensuring that appropriate care is provided. A screen was also incorporated into our electronic health record to provide nurses and unlicensed assistive personnel with the ability to document catheter insertion, care, and maintenance on a shift-to-shift basis. The addition of this documentation screen provided the team leaders with greater ability to audit the care delivery process for these patients.

Now that the team leaders have provided education via live presentations and during a skills lab, we are in the process of evaluating the effectiveness of all of the CAUTI prevention initiatives. We do not yet have enough data to make any statements about trends or patterns in patient outcomes. We are currently auditing records on a monthly basis to develop a patient profile and identify any possible gaps in learning and practice. The patient records we have reviewed since implementing this Prevention Plan show that most of these patients with CAUTI are critically ill and have multiple comorbidities. Thus far, the presence of CAUTI in our patient population has not driven any of these patients into a higher diagnosis-related group and therefore has not reduced reimbursement or significantly increased length of stay.

As a follow-up measure to the CAUTI Prevention Program, the chair of our Standards of Nursing Practice Council is conducting a survey of direct care nurses to assess their knowledge and identify gaps. Based on her findings, she will then develop a targeted education strategy to address these specific staff learning needs. The team leaders for the initiative have presented updates to the hospitalists and will continue to use a "Plan, Do, Check, Act" performance improvement model to evaluate components of the plan that are working well and discover areas for improvement and revision based on patient outcomes.

Implications for Practice

The adverse impact of CAUTI for patients in hospital settings can be avoided or at least greatly reduced by deploying prevention strategies that limit urinary catheter insertions to patients with appropriate conditions and diagnoses and encourages removing catheters as soon as possible. After catheters are inserted, the healthcare team is responsible for providing appropriate care and assessing patients at least daily to determine the earliest possible time for discontinuing the catheter. Holding physicians and mid-level providers accountable for writing orders that include indications for catheter placement, continuation, and removal contributes to CAUTI prevention also promotes a culture of safety for patients. Daily reviews of algorithms and CAUTI goals for all patients with indwelling urinary catheters on intradisciplinary rounds reminds team members to weigh infection risks versus catheter benefits and take appropriate actions to discontinue indwelling urinary catheters at the earliest possible opportunity.[10] Educating patients and families and their caregivers about the risks of inserting and/or continuing indwelling urinary catheters is important in helping them to understand the rationale for removal, especially in situations of urinary incontinence when leaving the catheter in might seem more convenient for both patients and their caregivers.

Conclusions

CAUTI is a common and preventable hospital-acquired condition that requires an intraprofessional team approach to prevention and monitoring strategies. Direct care nurses play a key role in preventing these infections by serving as a check and balance system to ensure that physicians and mid-level health providers follow established protocols for insertion, continuation, and removal of indwelling urinary catheters; educating and monitoring unlicensed assistive personnel in proper catheter and drainage system care; and providing guidance for patients and families regarding all aspects of CAUTI prevention.

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Oral Care in the ICU: Don't Forget to Brush – Continued from page 1

due to the presence of the endotracheal tube, tape, and bite blocks. For immediate identification of oral problems, performing an assessment is recommended daily with the use of a tool such as the "BRUSHED" model developed by Hayes and Jones.[7] This pneumonic prompts nurses to check for clinical signs of oral cavity problems daily. It includes an assessment of:

Table 1

B	Bleeding (gums, mucosa, coagulation status?)
R	Redness (gum margins, tongue, antibiotic stomatitis?)
U	Ulceration(size, shape, herpetic, infected?)
S	Salvia (xerostoma, hypersalivation, characteristics?)
H	Halitosis (character, acidotic, infected?)
E	External Factors (angular chelitis, endotracheal tapes?)
D	Debris (visible plaque, foreign particles?)

Hayes, J. Jones, C. A Collaborative approach to oral care during critical illness. Dent. Health (London) 1995, 34(3) 6-10

Additional assessment models, such as the Oral Assessment Guide (OAG) by Eilers et al, have been researched. The modified guide assesses a variety of factors of oral health, including the lips, mucous membranes/tongue, gums, teeth, and saliva, resulting in a numerical rating. Reliability of the tool to detect changes in the oral cavity, ultimately resulting in an improvement when oral care is delivered, has been researched.[8] The OAG also identified that the length of endotracheal intubation correlated with deteriorating oral health.[9]

Unfortunately, proper oral care in critically ill patients has met with many barriers. A total of 63% of surveyed nurses stated that cleaning the oral cavity is difficult.[10] Fear of dislodging the patient's endotracheal tube (ETT), fear of aspiration, fear of adding to the patient's discomfort, and nurses' time constraints are recognized as barriers.[11,12] Easier access to the oral cavity in patients with ETTs can be obtained with the use of endotracheal tube holders (Figure 1). In the same survey, 48% of nurses stated they were not trained in nursing school in oral care procedures for ventilated patients. Only 21% reported to have received training during continuing education courses.[10] One cannot assume that nurses know how to provide oral care. Because education has shown to be effective and is desired for improvement in oral care practices,[8] oral care education needs to be a component of employee orientation. Does your facility provide oral care education, including assessment?

Procedural as well as educational barriers have led to inconsistent oral care. Successful interventions for providing oral care include the use of a pediatric toothbrush, preorganized packets of oral care products, immediate setup of equipment with intubation in critical care units, scheduled oral care times documented in areas such as the medication administration record, and the use of protocols. The recommended guidelines from the Centers for Disease Control (CDC) for prevention of ventilator-associated pneumonia state: Develop and implement a comprehensive oral-hygiene program (that might include the use of an antiseptic agent) for patients in acute-care settings or residents in long-term care facilities who are at high risk for healthcare-associated pneumonia.[13]

The original protocol at the time of this recommendation included the following:

Policy:

- Assess the oral cavity upon admission and daily thereafter.
- Administer oral care every 2 to 4 hours; brush teeth twice daily.
- Assess intubated patients every 2 hours and prior to repositioning the tube or deflating the cuff to determine the need for removal of oropharyngeal secretions.

Procedure:

- Set up suction equipment.
- Position patient's head to the side or place in semi-fowler position.
- Provide deep oropharyngeal suction as needed to remove secretions that may migrate down the tube and settle on top of the cuff.

Figure 1. Dale® Stabilock Endotrachael Tube Holders (Dale Medical Products Inc.)

- Brush teeth using suction toothbrush with alcohol-free, antiseptic oral rinse.
- Brush for approximately 1 to 2 minutes.
- Exert gentle pressure while moving in short horizontal or circular strokes.
- Gently brush the surface of the tongue.
- Use a suction swab to clean the teeth and tongue between brushing or if brushing causes discomfort or bleeding.
- Place swab perpendicular to gum line, applying gentle mechanical action for 1 to 2 minutes.
- Turn swab in clockwise rotation to remove mucous and debris.
- Apply mouth moisturizer.
- Apply lip balm if needed.[14]

Since the origination of this protocol in 2001, variations have developed, but the basic premise—the need to perform oral care—is solid. In 2006, the American Association of Critical Care Nurses (AACN) introduced the current practice alert, "Oral Care in the Critically Ill." The goal of the AACN Practice Alerts is to help healthcare practitioners carry their bold voices to the bedside to directly impact patient care. The alert states:

- Develop and implement a comprehensive oral hygiene program for patients in critical care and acute care settings who are at high risk for healthcare-associated pneumonia.
- Brush teeth, gums and tongue at least twice a day using a soft pediatric or adult toothbrush.
- In addition to brushing, provide oral moisturizing to oral mucosa and lips every 2 to 4 hours.
- Use an oral chlorhexidine gluconate (0.12%) rinse twice a day during the perioperative period for adults.[15]

Several studies that report using a protocol have correlated oral care with a decreased occurrence of pneumonia.[4,9,14,16-18] Garcia identified 18 studies that demonstrated an association between oropharyngeal colonization and pulmonary infection.[11] The primary risk factor for development of healthcare-associated pneumonia is mechanical ventilation using an endotracheal tube. However, statistics vary. Patients with ventilator-associated Pneumonia (VAP) have an increase of 9.6 days on mechanical ventilation, higher mean hospital charges by approximately $40,000, and a median intensive care unit

(ICU) stay of 6.1 days longer than patients who do not have VAP.[19] These statistics exemplify why prevention of VAP is key.

Pneumonia occurs when normal pulmonary defense systems are impaired or overwhelmed. In most situations, the anatomy of the respiratory tract prevents most inhaled or aspirated microorganisms from reaching the alveoli. The upper respiratory tract normal flora act as part of the body's defense, preventing pathogens from colonizing in the oropharynx. However, within 24 to 48 hours of admission to the intensive care unit, patients have changes in oral flora to predominately Gram-negative organisms. Within several hours of initial intubation, subglottic secretions develop that pool above the cuff of the endotracheal tube. Patients aspirate these infected secretions on a continuous basis. The introduction of an endotracheal tube that provides continuous aspiration of subglottic secretions enhances the ability to remove these secretions and decrease pooling.[20] A study by Monroe found that oral health of critically ill patients is often compromised at the time of admission and deteriorates over time. A relationship exists between the patient's oral health status and VAP.[18]

Salivary volume and dental plaque may also play a role in VAP.[1,18] Good salivary flow enhances the removal of organisms. Circulation of saliva provides for removal of debris and plaque. Abnormalities in salivary flow may place patients at risk for overgrowth of organisms. The immune components of saliva control oral microorganisms; however, lower salivary volumes decrease this response and are associated with risk for VAP.[18] Factors that contribute to a decrease production of saliva include dehydration and medications such as benzodiazepines, haloperidol, and meperidine. Colonization of biofilm or dental plaque with potential pathogens is also linked with nosocomial infections.[18] Dental plaque and the number and type of oral organisms increase over time in the critically ill intubated patient. In a study by Seok-Mo and colleagues, isolates of *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Acinetobacter*, and enteric species recovered from plaque were indistinguishable from isolates obtained from bronchoalveolar lavage.[21] Increases in dental plaque are noted to predict VAP in severely critically ill patients, and optimal oral care should focus on plaque removal and stimulation of salivary flow.[18]

Toothbrushing provides the mechanical removal of dental plaque. An electric toothbrush with rotational brushes is found to be most effective, although it is not used in the acute care setting due to cost and availability. Even when manual brushing is used, the frequency varies within each institution.[10] Many oral care protocols recommend toothbrushing every 12 hours, with few or no specifics regarding the procedure. Fields conducted a study that directed the nursing staff to brush patients' teeth, tongue, and hard palate with a toothbrush and toothpaste for at least one minute every 8 hours supplemented by the use of a toothette and moisturizing ointment every 4 hours and compared this with "usual care." When the VAP rate decreased to 0, the control group was dropped. When the patients were removed from the study, [4] developed VAP when the nurses no longer followed the 8-hour schedule for toothbrushing.[1] Additional studies are needed to identify the most effective procedure and frequency in providing oral care. Perhaps protocols should be correlated with oral cavity assessment findings, critical care length of stay, or severity of illness. Protocols should also include patients who should be excluded from toothbrushing, such as those with severe ulcerations or profound clotting disturbances that can result in gingival hemorrhage.

> Easier access to the oral cavity in patients with ETTs can be obtained with the use of endotracheal tube holders.

Chlorhexidine gluconate, a broad-spectrum antibacterial agent, may also be effective in reducing plaque. A study using oral chlorhexidene gluconate (0.12%) rinse preoperatively on cardiac surgery patients showed a decreased incidence of nosocomial infection and is recommended by the AACN in the preoperative period.[15] However, other studies have been met with mixed reviews and have not shown superiority in cleansing with chlorhexidine solution.[22] A pilot study of military combat causalities were randomly assigned to receive chlorhexidine gluconate (spray or swab) soon after endotracheal intubation and were compared with a control group. Trends in the data suggested that the use of chlorhexidine gluconate may mitigate or delay the development of VAP. A repeat study of civilian trauma victims showed that a single dose of chlorhexidine early in the intubation period was effective in reducing early VAP.[23] Chlorhexidine is considered in some oral care protocols and is now being packaged in single-dose units along with prepackaged oral care kits.

The US Department of Health and Human Services priority recommendations to prevent healthcare-associated infections (HAIs) include the recommendation to perform "regular oral care with an antiseptic solution."[24] VAP is also one of the "never events" listed by the CDC and Center for Medicare & Medicaid Service (CMS), which will be linked to future reimbursement. No single strategy completely eliminates VAP. Therefore, strategies to prevent ventilator-associated pneumonia include more than just oral care. Additional strategies include:

Surveillance for VAP

- Adherence to hand hygiene guidelines
- Use of noninvasive ventilation when possible
- Daily assessments of readiness to wean
- Healthcare education
- Head of bed at 30 to 45 degrees
- Avoidance of unplanned extubation and reintubation
- Maintenance of endotracheal cuff pressures of at least 20 cm H_2O
- Avoidance of histamine receptor blocking agents and proton pump inhibitors for patients who are not at high risk for developing a stress ulcer[20]

Emerging studies for pneumonia prevention include looking at the importance of biofilm on ETTs. It is believed that on the ETT biofilm develops and contributes to colonization of the ventilated lungs. The development of antiseptic impregnated endotracheal tubes to prevent bacteria-loaded biofilm formation are available and continue to be investigated as an additional means of infection prevention.[25]

Multiple approaches and dedication to prevent healthcare-associated infections is required to make a difference. As the research regarding oral care and healthcare-associated infection prevention grows, re-

sulting in practice changes, VAP incidence should decrease. Continued research in various aspects of oral health needs to continue, and protocols need to be further defined. Although we rely on research to answer our questions, perhaps mother was right: "Don't forget to brush!"

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After reading this article, the learner should be able to:

1. Identify barriers which prevent proper oral care.
2. Discuss strategies to prevent ventilator associated pneumonia.
3. Identify at least 3 nursing practices that can reduce the risk of catheter-associated urinary tract infection.
4. Discuss the reason for properly securing the urinary catheter.

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1. **Daily assessment of the oral cavity should include:**
   - A. Assessment for bleeding, redness or ulcerations.
   - B. Characteristics of salvia.
   - C. Occurrence of halitosis
   - D. All of the above

2. **Barriers to providing proper oral care include:**
   - A. Time constraints
   - B. Fear of dislodging the patient's endotracheal tube.
   - C. Patient discomfort
   - D. All of the above.

3. **The recommended frequency of oral care in the Intensive Care Unit is:**
   - A. Every 4 hours; brush teeth daily.
   - B. Every 2-4 hours; brush teeth twice daily.
   - C. Every shift; brush teeth daily.
   - D. Every 8 hours; brush teeth twice daily.

4. **Findings that contribute to pneumonia in the critically ill include:**
   - A. A change in normal oral flora within 24-48 hours of admission to the ICU.
   - B. Lower salivary volumes.
   - C. An increase in dental plaque.
   - D. All of the above.

5. **Chlorhexidine gluconate, may be effective in decreasing nosocomial infection:**
   - A. In the postoperative period.
   - B. In military combat only
   - C. Since it is effective in reducing plaque.
   - D. Because of its antiviral effects.

6. **Strategies to prevent ventilator-associated pneumonia include:**
   - A. Hand Hygiene
   - B. Head of bed elevation to 20 degrees
   - C. Administration of histamine receptor blocking agents and proton pump inhibitors.
   - D. Deflating the cuff every shift

7. **Indwelling urinary catheters account for what percent of hospital-acquired urinary tract infections?**
   - A. 75%
   - B. 50%
   - C. 80%
   - D. 25%

8. **Which of the following risk factors for acquiring an infection is preventable in patients with indwelling urinary catheters?**
   - A. Comorbid infections
   - B. Failure to maintain a closed drainage system
   - C. Female gender
   - D. Previous history of urinary tract infections

9. **How much additional cost (approximate) did a patient with an acute myocardial infarction incur as a result of an episode of *Escherichia coli* bacteremia and sepsis associated with a hospital-acquired urinary tract infection?**
   - A. $1,000
   - B. $2,500
   - C. $3,500
   - D. $5,000

10. **The BEST means of preventing hospital-acquired catheter associated urinary tract infections in patients is_____.**
    - A. maintaining a closed urinary drainage system
    - B. assessing patients for risk factors on admission
    - C. limiting urinary catheter use and shortening catheter dwell times
    - D. inserting silver alloy coated urinary catheters

11. **The following is one of the indications for inserting/continuing an indwelling urinary catheter in a hospitalized patient:**
    - A. Incontinence
    - B. stage I pressure ulcer
    - C. Patient/family preference
    - D. Massive diuresis/hydration

12. **The frequency with which the healthcare team should assess patients with indwelling urinary catheters to determine the need to continue the catheter is_____.**
    - A. weekly
    - B. once per shift
    - C. daily
    - D. every other day

What is the highest degree you have earned (circle one) ? 1. Diploma 2. Associate 3. Bachelor's 4. Master's 5. Doctorate

Indicate to what degree you met the objectives for this program: Using 1 = strongly disagree to 6 = strongly agree rating scale, please circle the number that best reflects the extent of your agreement to each statement.

	Strongly Disagree					Strongly Agree
Identify barriers which prevent proper oral care.	1	2	3	4	5	6
Discuss strategies to prevent ventilator associated pneumonia.	1	2	3	4	5	6
Identify at least 3 nursing practices that can reduce the risk of catheter-associated urinary tract infection.	1	2	3	4	5	6
Discuss the reason for properly securing the urinary catheter.	1	2	3	4	5	6

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Mark your answers with an X in the box next to the correct answer

	A	B	C	D
1	☐	☐	☐	☐
2	☐	☐	☐	☐
3	☐	☐	☐	☐
4	☐	☐	☐	☐
5	☐	☐	☐	☐
6	☐	☐	☐	☐
7	☐	☐	☐	☐
8	☐	☐	☐	☐
9	☐	☐	☐	☐
10	☐	☐	☐	☐
11	☐	☐	☐	☐
12	☐	☐	☐	☐
13	☐	☐	☐	☐
14	☐	☐	☐	☐
15	☐	☐	☐	☐
16	☐	☐	☐	☐

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