

# Comprehensive oral care helps prevent hospital-acquired nonventilator pneumonia

A nurse-led prevention initiative proved that oral care is far more than just a comfort measure.

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**MAY GROSSMAN**, age 57, is admitted for elective surgery to reverse a colostomy from a previous surgical procedure. Her health has been good except for occasional diverticulitis bouts. She takes care of her three grandchildren several times a week.

Mrs. Grossman tolerates the surgery well until postop day 2, when she complains of shortness of breath. You measure her temperature at 101.4° F (38.5° C). A workup reveals an elevated white blood cell (WBC) count; a chest X-ray shows a left lower lobe infiltrate.

The physician initiates antibiotics and respiratory treatments, but Mrs. Grossman continues to deteriorate. She is transferred to the intensive care unit with a diagnosis of hospital-acquired pneumonia (HAP).

Nurses on medical-surgical and intensive care units (ICUs) are familiar with scenarios like this: A healthy person enters the hospital but deteriorates suddenly from HAP.

Since 2008, Medicare payment policy and the National Healthcare Safety Network (NHSN) have focused hospitals' efforts on reducing HAP and other hospital-acquired infections (HAIs) by mandating prevention policies and monitoring

of device-associated infections, such as central-line associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), and ventilator-associated pneumonia (VAP). Over the last 10 years, incidence of device-associated infections has dropped significantly.

But the three most common device-associated infections account for only about 25% of HAIs. What's more, VAP represents only 38% of total HAP cases. Hospitals are striving to meet NHSN requirements; yet monitoring and interventions to prevent nonventilator HAP (NV-HAP) aren't required. As

a result, cases like Mrs. Grossman's go unnoticed for their potential to inform basic nursing care and HAI prevention.

This article discusses the causes and impact of unaddressed NV-HAP and explains why we need to return to basic nursing and oral care to prevent this illness.

## Understanding NV-HAP

HAIs are infections not present on admission, with signs and symptoms arising at least 48 hours after admission. In NV-HAP, pneumonia isn't related to mechanical ventilation or VAP. (In our scenario, Mrs. Grossman acquired pneumonia after surgery and wasn't on a ventilator.)

NV-HAP is one of the most common HAIs in the United States—more common than CAUTIs and CLABSIs. It occurs on every type of unit, including maternity, pediatrics, and low-risk surgery units. Although it carries the same mortality as VAP, its incidence is higher; thus, associated costs and deaths are higher. Also, NV-HAP patients are at greater risk for readmission within 30 days than patients without HAIs. Given the personal and economic burden of NV-HAP, nurses should lead their hospitals in monitoring and implementing effective NV-HAP prevention programs.



### LEARNING OBJECTIVES

1. Identify the burden and pathophysiology of nonventilator hospital-acquired pneumonia (NV-HAP).
2. State the steps for preventing NV-HAP.
3. Describe a protocol for comprehensive oral care.

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## Preventing hospital-acquired pneumonia

### NV-HAP pathogenesis and prevention

During a hospital stay, significant changes occur in a patient's microbial flora and ability to maintain basic hygiene functions, such as daily oral care. Three key factors predisposed Mrs. Grossman to HAP—changes in oral microbes, microaspiration (subclinical aspiration of small droplets), and a weakened host.

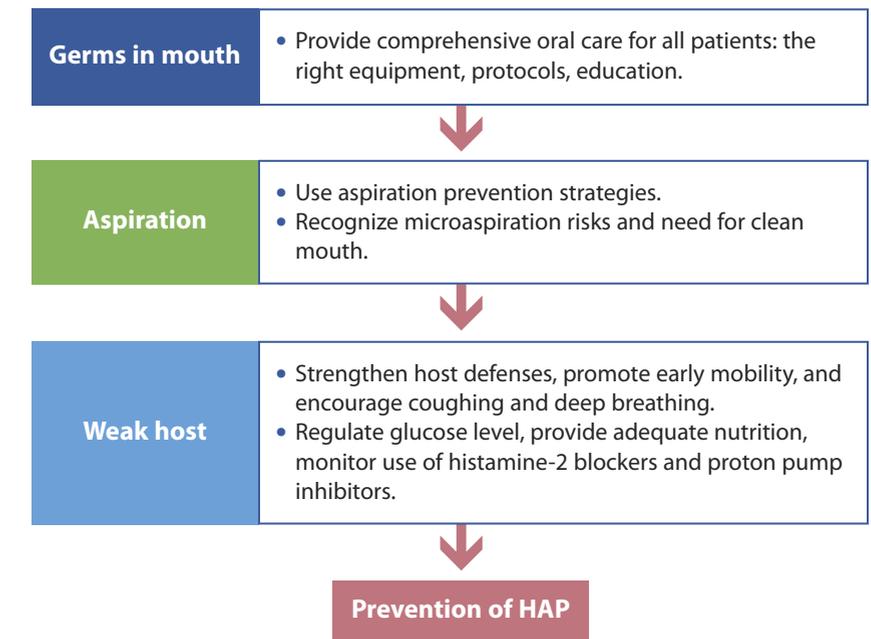
Studies show that within 48 hours of admission, critically ill patients experience changes in oral bacterial colonization, including more virulent gram-negative organisms. Moreover, even healthy adults microaspirate while sleeping, from such causes as supine positioning and drugs that suppress the central nervous system. Microaspirations typically don't lead to disease. But in hospital patients, microaspirations combined with decreased mobility and changes in the oral flora create an ideal environment for microbes to flourish in the pulmonary tract.

Also, hospitalization itself can weaken a patient's natural defenses and typically disrupts daily care patterns. Patients may lack the energy or desire to perform basic care, such as effective oral hygiene, unless caregivers encourage it and teach them about its importance. This happened with Mrs. Grossman; she was exhausted after surgery and no oral care was recorded.

### Preventing HAP

Pneumonia risk can be reduced through basic care measures, including early and frequent mobilization, assessing the patient's aspiration risk, elevating the head of the bed, and promoting lung expansion. However, except for ICU patients on mechanical ventilators, the link between basic oral care and pneumonia prevention hasn't been well studied.

Because the 20 billion microbes



in our mouths replicate every 4 to 6 hours and patients microaspirate these microbes, reducing oral microbes is crucial to HAP prevention. In one study, researchers found that oral care went undocumented in the 24 hours before NV-HAP diagnosis 73% of the time. This means missed nursing care may have contributed to NV-HAP caused by increased microbial load and oral flora changes. In our hospital, some nurses stated they avoided oral care for patients with known aspiration risk for fear they'd aspirate.

Nurses have been surveyed to analyze their understanding of the importance of oral care and knowledge of standards for oral care practices. The surveys found that although nurses understand that oral care increases patients' comfort, they may not appreciate the pneumonia risk linked to missed oral care, especially in non-intubated patients. Thus, nurses should receive enhanced education on the importance of oral care, the need for increased access to effective oral-care supplies, and clear protocols that specify the required frequency of oral care and its doc-

umentation. (See *Preventing hospital-acquired pneumonia*.)

### HAPPI team

Based on these findings and to help prevent HAP and other adverse events, our interprofessional group at Sutter Medical Center in Sacramento, California, began a HAP prevention initiative (HAPPI) in 2012. This nurse-led oral-care initiative has reduced NV-HAP incidence by 60% and saved the hospital more than \$2 million over 1 year.

The HAPPI team includes staff from nursing, rehabilitation services, nutrition services, infection control, respiratory therapy, material supplies, and administration, in addition to physicians. The team meets monthly to plan, implement, and monitor the NV-HAP prevention program.

Initial steps included a gap analysis, which compared best practices and published guidelines with current nursing practices. Gaps revealed by the analysis helped determine what changes to make in nursing practice. (See *What the gap analysis found*.) The HAPPI team addressed each barrier

## What the gap analysis found

As part of the hospital-acquired pneumonia prevention initiative at Sutter Medical Center (SMC) in Sacramento, team members compared best oral-care practices and guidelines with the facility's current nursing practices. The analysis revealed the following gaps.

Best practice	Gaps found at SMC	Interventions
Use oral-care products recommended by American Dental Society (ADA).	Lack of: <ul style="list-style-type: none"> <li>• soft-bristled toothbrushes</li> <li>• alcohol-free antiseptic rinse</li> <li>• therapeutic toothpaste</li> <li>• petroleum-free lip moisturizer</li> <li>• denture-care products</li> <li>• suction equipment for patients at risk of aspiration</li> </ul>	<ul style="list-style-type: none"> <li>• Stock products that meet ADA recommendations.</li> <li>• Stock products that can be used safely for non-ventilated patients at risk for aspiration.</li> </ul>
Use a comprehensive oral-care protocol for all patients.	<ul style="list-style-type: none"> <li>• Oral-care protocol did not include nonventilated patients.</li> <li>• Staff was unaware of oral-care protocol.</li> </ul>	<ul style="list-style-type: none"> <li>• Revise oral-care protocol to include all patients.</li> </ul>
Document oral care provided.	<ul style="list-style-type: none"> <li>• Lack of clear documentation system for type and frequency of oral care</li> </ul>	<ul style="list-style-type: none"> <li>• Revise nursing documentation form.</li> <li>• Measure and monitor frequency of oral care.</li> </ul>
Ensure staff are knowledgeable about and able to deliver appropriate oral care.	Staff lacked: <ul style="list-style-type: none"> <li>• understanding that oral microbes can cause NV-HAP</li> <li>• education and products needed to provide effective oral care.</li> </ul>	<ul style="list-style-type: none"> <li>• Develop staff education, which should include return demonstration.</li> </ul>

now specifies what supplies to use, what procedures to follow, and how frequently to perform oral care. Although we couldn't find research on optimal frequency of oral care for med-surg patients, we determined it should be done four times daily, based on how quickly oral bacteria replicate (five times per 24 hours). The new protocol was put in easy-to-read table format, enlarged, and posted in supply rooms for easy access. (See *Oral-care protocol*.)

### Documenting oral care

As with any other patient-care process, oral care should be documented. But our documentation system lacked a place to record the type and frequency of oral care provided. So we enlisted staff to redesign the documentation of basic nursing care in the medical record. The redesign was piloted and refined repeatedly until staff were satisfied.

Documenting oral care also was essential for monitoring our quality-improvement project and determining the impact of oral care on NV-HAP rates. To reinforce the importance of oral care, we conducted unit audits to monitor oral-care delivery, related issues, and barriers to providing adequate oral care on HAPPI units.

### Education

We completed an oral-care knowledge and attitude survey before the oral-care intervention to determine the staff's educational needs. Results were telling: The majority of our nursing staff didn't know we had an oral-care protocol and few nurses were aware of the link between oral microbes and pneumonia. (We recommend including nurses' aides in surveys and comprehensive education sessions in hospitals where they provide basic oral care.)

We then developed an oral-care education program in collaboration

to an effective oral-care program; interprofessional collaboration helped overcome these barriers.

### Addressing lack of supplies

Gap analysis showed our nurses lacked the right supplies to perform effective oral care.

- The small, stiff toothbrushes our hospital (and many others) used didn't meet American Dental Association (ADA) recommendations for soft-bristled toothbrushes and were inadequate for oral care.
- Units weren't stocked with alcohol-free antiseptic mouthwash, petroleum-free lip moisturizers, or sodium bicarbonate toothpaste that can remove dental plaque.
- Basic denture cleansers and adhesives were missing from supply shelves.

- Suction toothbrushes and other oral-care supplies weren't readily available for patients at risk for aspiration.

Besides bringing our oral-care supplies up to ADA standards (including suction toothbrush kits similar to those used for ventilated ICU patients), we decided to provide easy-to-use, ready-to-go, complete oral-care supplies and to restock regularly.

### Updating our oral-care protocol

The Centers for Disease Control and Prevention's 2003 Guidelines for the Prevention of HAP state that all patients should receive comprehensive oral care. Gap analysis showed our hospital had an oral-care protocol only for ventilated ICU patients.

To remedy this, we updated the protocol to cover all patients. It

## Oral-care protocol

Sutter Medical Center developed the oral-care protocol shown here to help prevent hospital-acquired pneumonia. When providing oral care, follow these guidelines:

- Always use personal protective equipment when assisting patients with mouth care, including gloves, mask, and face shield.
- Know that disposable swabs are for one-time use only. Don't soak them in a cup for later reuse.
- Document oral care in the patient record.

Patient description	Equipment	Procedure	Frequency
Patient is: • able to perform self-care (or needs minimal assistance) <i>AND</i> • is able to expectorate.	<ul style="list-style-type: none"> <li>• Soft toothbrush</li> <li>• Plaque-removing toothpaste</li> <li>• Alcohol-free antiseptic oral rinse</li> <li>• Mouth moisturizer and one or two swabs to apply it</li> </ul>	<ul style="list-style-type: none"> <li>• Set patient up at sink or in bed with all equipment.</li> <li>• Instruct patient to brush teeth for 1 to 2 minutes.</li> <li>• Instruct patient to swish and spit antiseptic oral rinse.</li> <li>• If desired, moisturize interior of oral cavity and lips using a swab as needed.</li> <li>• Discard disposable equipment and swab in appropriate receptacle.</li> </ul>	After each meal and before bedtime. If patient can't receive oral intake, provide oral care in morning, mid-day, evening, and bedtime.
Patient is: • dependent for oral care <i>OR</i> • unable to expectorate <i>AND</i> • at risk for aspiration.	<ul style="list-style-type: none"> <li>• Suction toothbrush</li> <li>• Alcohol-free antiseptic oral rinse</li> <li>• Mouth moisturizer and one or two swabs to apply it</li> </ul>	<ul style="list-style-type: none"> <li>• Moisten suction toothbrush in antiseptic oral rinse.</li> <li>• Connect suction toothbrush to continuous suction.</li> <li>• Brush teeth for 1 to 2 minutes.</li> <li>• Suction debris from mouth.</li> <li>• Using swab, apply moisturizer to interior of oral cavity and lips.</li> <li>• Discard disposable equipment in appropriate receptacle.</li> </ul>	Same as above
Patient is: • dependent for oral care <i>AND</i> • on a mechanical ventilator.	<ul style="list-style-type: none"> <li>• Suction toothbrush or swab</li> <li>• Oral cleansing solution in toothbrush kit</li> <li>• Mouth moisturizer</li> <li>• Chlorhexidine oral rinse, if patient is on ventilator or if ordered</li> </ul>	<ul style="list-style-type: none"> <li>• Perform suction as needed to remove oropharyngeal secretions that may have migrated down tube and settled atop cuff.</li> <li>• Moisten suction toothbrush with oral cleansing solution; connect suction toothbrush to continuous suction.</li> <li>• Remove debris and clean gums, tongue, and inside of cheeks.</li> <li>• Suction debris from mouth.</li> <li>• Using swab, apply moisturizer to interior of oral cavity and lips.</li> <li>• Discard disposable equipment and swab in appropriate receptacle.</li> </ul>	Every 4 hours and as needed to remove oral debris. If patient is on ventilator, use chlorhexidine rinse as oral care solution in morning and at bedtime.
Patient has dentures or no teeth.	<ul style="list-style-type: none"> <li>• Denture cup (labeled)</li> <li>• Soft toothbrush</li> <li>• Denture cleaner (for soaking only)</li> <li>• Two swabs</li> <li>• Alcohol-free antiseptic rinse</li> <li>• Denture adhesive (optional)</li> </ul>	<ul style="list-style-type: none"> <li>• Remove dentures and place in labeled denture cup.</li> <li>• Brush palate, buccal surfaces, gums, and tongue with toothbrush or swab.</li> <li>• Have patient swish and spit antiseptic rinse, or use swab to apply rinse.</li> <li>• Line sink with paper towel and add water to cushion dentures in case they're dropped. Carefully brush dentures with warm water. <i>Do not use toothpaste</i> as it may scratch dentures.</li> <li>• Clean and dry equipment and return it to bedside table.</li> <li>• Help patient insert dentures in mouth.</li> <li>• After bedtime mouth care, soak dentures in commercial cleanser in denture cup.</li> <li>• If patient needs adhesive to hold dentures firmly in place, follow manufacturer directions.</li> </ul>	After each meal and at bedtime.

Resource for protocol development:

Johnson VB, Chalmers J. Oral hygiene care for functionally dependent and cognitively impaired older adults. In: Schoenfelder DP, ed. *Series on evidence-based practice for older adults*. Iowa City, Iowa: University of Iowa College of Nursing, John A. Hartford Foundation Center of Geriatric Nursing Excellence. 2011. [www.guideline.gov/content.aspx?id=34447](http://www.guideline.gov/content.aspx?id=34447)

with the local dental society (which served as an expert resource). The program covered HAP causes and prevention, our new oral-care protocol, and demonstration of our new oral-care equipment, which empowered staff to deliver this valuable basic intervention.

We also developed a patient and family education program, which included a poster and flyers detailing the importance of oral care during hospitalization. We placed the posters in elevators and hallways and used the flyers in one-on-one education sessions with patients and family members.

### **Audits and monitoring to sustain quality improvements**

Collecting and sharing relevant data can help motivate staff, change behavior, and sustain improvement. Before HAPPI, we'd measured and reported a baseline average for two measures—NV-HAP (an outcome measure) and how often oral care was documented for patients (a process measure). Baseline data enabled us to measure improvement. By collecting and reporting on both types of measures, we were able to connect nursing practice with patient outcomes. This was meaningful to staff and helped engage them in ongoing improvement efforts.

Each month, we measured oral-care frequency by sampling 10 patients on each unit and counting the number of oral-care episodes they'd had in the previous 24-hour period. Also, each month we identified the number of NV-HAP cases per unit and the hospital's NV-HAP rate. Every quarter, we analyzed data and put it into graphs for each unit. We were able to show staff that as oral-care frequency increased, NV-HAP cases decreased. The reports included case studies of patients who'd acquired NV-HAP. These stories spoke to the hearts of staff ("These are our patients") and spurred them to seek

continued improvement.

We shared quarterly NV-HAP reports in many venues, including small unit-based staff meetings, quality council meetings, and hospital boardrooms. We used the data to celebrate oral-care improvements and NV-HAP decreases. We recognized and rewarded units that made and sustained improvements, in a way that was fun for both staff and management. For example, a volunteer dressed as the Tooth Fairy to present oral care staff development, and directors wore toothbrush and toothpaste costumes to present data to executives.

### **Making a difference in lives and costs**

Our HAPPI program has made a difference in patients' lives and hospital costs. When we compared data before and after implementation of our comprehensive oral-care program, we found a statistically significant difference in NV-HAP incidence— $p < .0001$ ; odds ratio = 0.51; 95% confidence interval = 0.38, 0.70.

Patients admitted during the intervention year were 49% less likely to acquire NV-HAP than those admitted the year before the intervention. This means we'd avoided 60 NV-HAP cases and saved more than \$2.4 million by avoiding extra hospital days. With the \$117,600 expenditure for our new, higher-quality oral-care supplies, the return on investment (ROI) was \$2.28 million. Given the economic stress for all hospitals these days, this ROI for basic nursing care can't be overlooked.

Evidence-based nursing care has an even more significant reach. Consider what happened to May Grossman.

*NV-HAP added 7 days to May Grossman's hospital stay. Instead of being discharged her to her home where her family could have*

*cared for her, she was discharged to a skilled-care facility, where she stayed an additional month. She wasn't able to resume her role as care provider to her grandchildren, and she lost part of her previous quality of life.*

Today, with our new HAPPI program, she and her family would have received education on the importance of oral care, along with help and support to perform oral care four times daily. She could have avoided a prolonged hospital stay and retained her quality of life.

Nurses need to use current evidence to develop programs that emphasize the importance of basic oral care—not just for comfort but also as an essential life-saving measure. Implementing an oral-care program with every hospital patient is an indispensable part of the national effort to protect patients from HAIs. ★

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**Please mark the correct answer online.****1. Patients on mechanical ventilators account for what percentage of hospital-acquired pneumonia (HAP) cases?**

- a. 23%
- b. 38%
- c. 49%
- d. 57%

**2. Patients may be diagnosed with HAP if they develop signs and symptoms of pneumonia how long after admission?**

- a. 8 hours
- b. 16 hours
- c. 24 hours
- d. 48 hours

**3. Which type of hospital-acquired infection (HAI) is among the most common?**

- a. Central line-associated bloodstream infection (CLABSI)
- b. Catheter-associated urinary tract infection (CAUTI)
- c. Ventilator-associated pneumonia
- d. Nonventilator HAP (NV-HAP)

**4. Which of the following statements about NV-HAP is correct?**

- a. It increases the risk for readmission within 30 days.
- b. It has not been found on pediatric units.
- c. It has no effect on hospitalization costs.
- d. It does not occur in maternity patients.

**5. Which statement about NV-HAP pathogenesis is accurate?**

- a. Within 48 hours of admission, critically ill patients experience changes in oral bacterial colonization, including more virulent gram-positive organisms.
- b. Healthy adults do not experience microaspirations.
- c. Microaspirations may be caused by drugs that stimulate the central nervous system.
- d. Within 48 hours of admission, critically ill patients experience changes in oral bacterial colonization, including more virulent gram-negative organisms.

**6. Strategies for preventing NV-HAP include:**

- a. elevating the head of the bed.
- b. keeping the head of the bed flat.
- c. delaying mobility for 24 hours.
- d. delaying mobility for 48 hours.

**7. A strategy that addresses strengthening the host to prevent NV-HAP is:**

- a. restricting calories and fat intake.
- b. using mouthwashes that contain alcohol.
- c. triaging which patients need dental care.
- d. limiting the use of histamine-2 antagonists.

**8. What is an appropriate action to take if your patient is dependent on oral care and can't expectorate?**

- a. Use a soft, nonsuction toothbrush.
- b. Keep the oral swab in a cup so it can be reused.

- c. Apply moisturizer to the lips and oral cavity.
- d. Use a hard toothbrush for brushing.

**9. Oral care for a patient who has dentures should include:**

- a. using a toothpaste to clean the dentures.
- b. soaking the dentures in a commercial cleanser.
- c. brushing only the tongue and gums.
- d. brushing the dentures for 30 seconds to 1 minute.

**10. Instruct patients who can perform oral care on their own to brush for:**

- a. 30 to 45 seconds.
- b. 45 seconds to 1 minute.
- c. 1 to 2 minutes.
- d. 4 to 5 minutes.

**11. When should oral care be completed for a patient who isn't eating?**

- a. Morning, mid-day, evening, and bedtime
- b. Morning, mid-day, and evening
- c. Morning and mid-day
- d. Morning

**12. Which oral care product is not recommended by the American Dental Association?**

- a. Soft-bristled toothbrush
- b. Petroleum-free lip moisturizer
- c. Therapeutic toothpaste
- d. Antiseptic rinse that contains alcohol