

Interprofessional Practice: Translating Evidence-Based Oral Care to Hospital Care

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Introduction

Oral Hygiene in Hospital Settings

A diagnosis of ventilator-acquired pneumonia (VAP) is made when an intubated, mechanically ventilated patient is diagnosed with pneumonia 48 hours after admission. VAP has been associated with poor oral hygiene, and this link has galvanized healthcare workers and researchers to explore effective methods of oral hygiene to reduce rates of VAP and other nosocomial infections.¹ Oral care regimens to improve oral health have been well established in the outpatient setting, but such standards are not as consistent in critically ill hospitalized patients. While intensive care unit (ICU) nurses rate oral care as important, most oral care practices in the ICU are inadequate. Protocols usually consist of foam sticks, standard toothpastes, and a saline rinse. Although the American Association of Critical Care Nurses (AACN) has advocated toothbrushing and declared it to be one of the standards of critical care, less than 44% of critical care nurses report brushing teeth.²

Toothbrushing has been described as the single most important oral hygiene activity,³ and toothbrushing twice daily reduces oral debris and biofilm. Over the past decade, electric toothbrushes have been shown to be superior to manual toothbrushes in biofilm reduction and improved gingival health. The benefits of oral care for critically ill, intubated patients have been conceded by healthcare professionals.⁴ Studies that have been conducted to examine this link are important but inadequate. One reason that critical care nurses in the neurosurgical field may be reluctant to perform consistent toothbrushing for intubated patients is the concern that toothbrushing may contribute to increased intracranial pressure (ICP). Therefore, some nurses prefer foam swabs to toothbrushes, despite the fact that toothbrushing is the standard of care recommended by the AACN.⁵ Patient safety is a critical aspect of oral health

that must be addressed before oral care efficacy trials can be implemented.

Oral hygiene for intubated patients may be hindered by the presence of the oral endotracheal tube, oral gastric tubes, bite blocks, and the adhesive tape that secures such devices. As a result of restricted access to the oral cavity, nurses may delay tasks such as toothbrushing, which creates a worsened pathogenic state within the patient's mouth.

The Center for Medicare and Medicaid Services has restricted or ceased payment for infections acquired in a hospital setting, and approximately 99,955 beds are dedicated to ICUs in the U.S. Thus, evidence to support the safety and efficacy of oral hygiene for the critically ill patient must be demonstrated to reduce the risk of hospital-associated infection and VAP.

Translating Oral Hygiene into Practice: Results of a Randomized Controlled Trial (RCT)

Recognizing the need for more research on oral hygiene and associated VAP, we performed an RCT to monitor changes in ICP and cerebral perfusion pressure (CPP) while providing oral care. Over a two-year period, we compared variations in oral health during intubation to changes in oral and respiratory nosocomial colonization among intubated neuroscience ICU patients.

Patients were randomized to one of two groups: those who would receive a standard oral care protocol, and those who would receive a comprehensive oral care protocol. The tools used for the standard oral care protocol included a manual pediatric toothbrush, standard foaming toothpaste, and water-soluble lubricant. The equipment provided for the comprehensive protocol group consisted of a tongue scraper, a

power oscillating rotating toothbrush with a non-foaming toothpaste, and a moisturizing agent. Both groups received the assigned oral care protocol twice daily, with toothbrushing lasting two minutes per occasion. Chest radiographs and oral and sputum cultures were obtained upon admission to the ICU and were repeated every 48 hours while the patient remained intubated. Oral health was measured according to the Bed-side Oral Exam (BOE), and these scores were recorded on the day of enrollment in the trial, the day of extubation, and 48 hours after extubation.

An interim safety analysis was performed upon 47 adult neuroscience ICU patients with an ICP monitor. ICP and CPP (cerebral perfusion pressure) were recorded before, during, and after oral care over the first 72 hours of admission. Of 807 ICP and CPP measurements obtained before, during, and after oral care, there were no significant differences in ICP ($P=0.72$) or CPP ($P=0.68$) between toothbrushing methods. In the absence of preexisting intracranial hypertension, toothbrushing was safely performed in intubated neuroscience ICU patients.

Oral health deteriorated in both groups, but key differences existed between the deteriorations. In the standard oral care group, the BOE total score and all eight categories significantly deteriorated (Friedman Test $p<0.001$, Bonferroni correction) and did not return to baseline after extubation. Large effect sizes were present at all three timepoints in this group. In the comprehensive oral care group, total BOE deteriorated during intubation (Friedman Test $p<0.004$) but returned to baseline status after extubation. There was no significant deterioration in the ratings on tongue, mucous membranes, gingiva, or teeth over time in the comprehensive oral care group. Oral colonization upon admission was noted in 25% of patients in each protocol. Although there were trends of reduced oral and respiratory nosocomial colonization among those in the comprehensive oral care group, no significant differences were noted between groups. Incidence of VAP was equivalent ($p=0.61$) for the standard and comprehensive groups at day six.

Discussion

The comprehensive oral care protocol demonstrated superiority to current published standards for ICU oral care protocols as measured by the BOE. The tongue scraper, power toothbrush,

non-foaming toothpaste, and oral moisturizers were found to be the most effective tools for oral hygiene during intubation period as evidenced by BOE item scores of tongue, teeth, gingiva, and mucous membranes. Previously unreported in critical care oral protocols, the tongue scraper was effective in preserving tongue hygiene as noted by the BOE item scores and supported by the reduction in odor compared to the standard protocol (odor was included as a new measurement parameter on the BOE).

Among patients who received comprehensive oral care, there was a trend of a decreased conversion to oral nosocomial colonization. The incidence of VAP, though equivalent in both groups, reflected a decreased trend among patients receiving comprehensive oral care. Because the study was underpowered, larger studies are needed to further investigate the benefits of comprehensive oral care, and further studies are needed to assess the long-term impact of oral hygiene on oral health and patient comfort.

Hospital-wide Changes in Oral Hygiene

The results of this study, combined with other evidence of the benefits of oral care, were the motivation for changes in oral care practices at St. Joseph's Hospital and Medical Center in Phoenix, Arizona. An Oral Health Initiative Committee comprised of experts representing clinical and management areas was established. Members of this multidisciplinary committee reviewed results of the RCT and protocols and ultimately elected to incorporate the BOE and comprehensive oral care protocol for all patient units. The comprehensive oral care protocol was further refined based on BOE scores and subsequently referred to as the Barrow Oral Care Protocol (BOCP). All medical and nursing committees hospital-wide agreed to the implementation of the BOCP.

Using a descriptive case design for implementation and evaluation of oral assessments and oral hygiene, we explored quality improvement data for incidence of VAP and the cost effectiveness of oral hygiene supplies using the expanded range of oral hygiene products. Incidence of VAP and the cost of oral care supplies before and after implementation were compared in the Trauma ICU over a 2-year period.

The incidence of VAP fell significantly from 4.21 to 2.1 per 1000 ventilator days ($p=0.04$). Average monthly costs for oral care products

used in 2011 were \$4000.00. After implementation of the BOE and BOCP, the average monthly cost in 2012 was \$1453.00, a savings of 65%. Cost-effective, comprehensive oral care appears to help reduce VAP, and the BOE and BOCP remain in place at our institution.

Current Practices and Future Recommendations

Although nurses are responsible for conducting assessments and performing interventions for other body systems, such as hemodynamic monitoring and administration of blood pressure medications, oral health assessments and research-based oral care practices are not routinely performed. Oral assessments are done in dental settings every day, by both dentists and hygienists. When dental professionals administer these assessments, they use a wide variety of tools, including mouth mirrors, periodontal probes, loupes, headlights, digital radiography, and cancer screening equipment. Generally, the nurses who perform oral assessments have neither the tools nor the training to do so effectively. Comatose or intubated patients are often unable to indicate whether they are in pain or describe discomfort, and the tubes make it challenging to thoroughly examine the mouth. Ad-

ditionally, the treatment setting is not conducive to provision of detailed oral care, as the patients are in a bed, not a reclining dental chair. Heavier patients are in a wider bed, which makes it difficult for the nurse to reach the mouth.

Healthcare professionals who recognize and advocate for systemic oral health protocols for hospitalized patients and the success of our research have called attention to oral health and hygiene practices. Some facilities have employed an inpatient registered dental hygienist to assess and perform complex oral hygiene assessments, thereby meeting the demand for cost-effective oral health assessments and reducing the rate of nosocomial infections. Our institution plans to collaborate with local dental hygiene schools to establish student rotations as part of the students' curricula.

Though advancements in oral health have dramatically improved in the United States over the past 25 years, the need for further collaboration among health providers in dentistry, medicine and allied healthcare providers is critical.⁶ Such collaboration is fundamentally important in healthcare settings, where the status of oral health has gained heightened awareness to prevent disease.

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