Applied Nursing Research 44 (2018) 48–53

Contents lists available at ScienceDirect

Applied Nursing Research

journal homepage: www.elsevier.com/locate/apnr

Original article

Reducing missed oral care opportunities to prevent non-ventilator associated hospital acquired pneumonia at the Department of Veterans Affairs

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ARTICLE INFO

Keywords:
Hospital acquired pneumonia prevention
Oral care
Veterans
Non-ventilator

ABSTRACT

Consistently delivered, effective oral care targets bacterial multiplication reducing the risk of non-ventilator associated hospital acquired pneumonia (NV-HAP).

Aim: Determine the effect of a twice daily oral care initiative on the incidence and cost of NV-HAP.

Methods: This single arm intervention study used pre/post population data to determine the effectiveness of a universal, standardized oral care protocol vs. usual care in preventing NV-HAP. This phase followed a retrospective study of 14,396 patient days (2002-2012) that determined the pre-intervention levels of nursing care provided, and the overall disease prevalence.

Results: The pilot incidence rate on the geriatric units decreased from 105 to 8.3 cases per 1,000 patient days (by 92%) in the first year. The intervention yielded an estimated cost avoidance of $2.84 million and 13 lives saved in 19 months post-implementation. Expansion of this study as quality improvement is in progress at 8 VA hospitals with plans for national VA deployment.

Conclusions: While oral care may seem deceptively simple in terms of base care provision, hospital and nursing services struggle to provide effective oral care delivery with high-reliability. Barriers to oral care include: (1) the perception that oral care is an optional daily care activity for patient's comfort, (2) hospitals supply inadequate, poorly designed oral care materials, and (3) hospitals are not required to monitor the incidence of NV-HAP. The impact of consistently delivered oral care is substantial in terms of Veteran health, quality of life, and well-being in addition to considerable cost avoidance.

1. Introduction

Prevention of hospital acquired infections was recently named one of the top 10 public health concerns for patient safety by the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention (CDC), 2016). Hospital acquired pneumonia (HAP) is the leading cause of healthcare acquired infections (Magill et al., 2017). Despite public health concern, there are currently no requirements from regulatory agencies to track hospital acquired pneumonia among non-ventilated patients and no incentives to improve poor oral care which is a modifiable risk factor for this infection.

HAP accounts for 25% of all hospital-acquired infections in the U.S. annually (Magill et al., 2017). HAP prevention has historically focused primarily on ventilator associated pneumonia (VAP), but of growing concern is the rate of non-ventilator associated hospital acquired pneumonia (NV-HAP) which comprises 60% of HAP cases and places an estimated 35 million U.S. patients at risk annually (Baker & Quinn, 2018; Magill et al., 2014). NV-HAP mortality rates are reported as high as 15 to 30% with an incidence of 1.22–8.9/1000 patient days (Magill et al., 2014; Micek, Chew, Hampton, & Kollef, 2016; Quinn et al., 2014). NV-HAP occurs on every type of hospital unit with a higher incidence, mortality (18%), and higher costs than VAP (Davis & Finley, 2012).

To clarify matters, some of the types of pneumonia are defined. Community acquired pneumonia is present on admission with signs and symptoms noted ≤48 h after admission (Kollef, 2007). HAP is defined as pneumonia that was not present on admission and occurs > 48 h after hospital admission (Kalil et al., 2016). VAP is a device associated pneumonia that develops 48–72 h after intubation (Kalil et al., 2016). Lastly NV-HAP, the focus of the study, occurs 48 h or more after admission in the non-ventilated patient (Kalil et al., 2016).

Patients who develop NV-HAP are over 8 times more likely to die

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https://doi.org/10.1016/j.apnr.2018.09.004
Received 28 June 2018; Received in revised form 2 September 2018; Accepted 16 September 2018
0897-1897/ Published by Elsevier Inc.

than their equally ill matched controls who do not develop NV-HAP (Micek et al., 2016). In addition, patients with NV-HAP require increased intensive care days, mechanical ventilation, and broad-spectrum antibiotics, and have a length of stay up to 4 times longer than patients without NV-HAP (Micek et al., 2016; Thompson, Makary, Dorman, & Pronovost, 2006). Prevention of even 100 cases of NV-HAP provides an estimated cost avoidance of $4 million and saves the lives of over 20 patients (Giuliano, Baker, & Quinn, 2018).

Veterans who develop NV-HAP require an increased hospital stay of 10–14 days, 17.2% die from the disease or related complications such as sepsis, and like 40% of NV-HAP non-veteran patients, they are discharged to long-term care, hospice, or palliative care increasing the burden on patients, family members, and the larger community (Baker & Quinn, 2018; Munro, 2018; Thompson et al., 2006). NV-HAP has an associated hospital cost of $40,000 or more per patient (Baker & Quinn, 2018; Kalil et al., 2016). Adding to the tremendous cost of NV-HAP is the up to 50% increased risk of sepsis in patients who develop HAP (Angus & Van der Poll, 2013).

2. Oral care as a modifiable risk factor

Providing consistent oral care, 2 to 4 times a day, may decrease the risk of NV-HAP by 40–60% (Baker & Quinn, 2018). In the absence of regular oral care, a biofilm quickly develops and is colonized by harmful bacteria from the mouth and the lungs which double every 2–3 h (Avila, Ojcius, & Yilmaz, 2009; Gomes-Filho, Passos, & da Cruz, 2010; Raghavendran, Mylotte, & Scannapeico, 2007). Forty five percent of adults silently micro-aspirate oral secretions into their lungs during sleep increasing the risk of pneumonia (Gleeson, Eggli, & Maxwell, 1997; Kollef, 2007; Sarin, Balasubramaniam, Corcoran, Laudenbach, & Stoopler, 2008).

A meta-analysis and systematic review of randomized controlled trials found that mechanical removal of the oral biofilm through simple tooth brushing alone reduced the relative risk of pneumonia and reduced the risk of fatal pneumonia (RRfixed, 0.61; 95% CI (0.40–0.92), $p = .02$; RRfixed, 0.41; 95% CI (0.23–0.71); $p = .002$ respectively) (Kaneoka et al., 2015). Prevention of NV-HAP by providing oral care, the most common modifiable risk factor, has the potential to improve health care quality and make health care safer for patients (Chew, Hampton, & Kollef 2016; Klompas, 2016; Micek; Quinn et al., 2014; Sopena et al., 2014).

Oral health is one of the Healthy People 2020 Leading Health Indicators, OH-7, and a priority of the VA (U.S. Department of Health and Human Services, 2018). When patients develop NV-HAP, it increases their risk of discharge to a long-term care facility decreasing their quality of life and places a significant burden on their family and community (Baker & Quinn, 2018). Providing consistent oral care is one of the most studied measures in HAP prevention and is the only modifiable risk factor that applies to 100% of patients (Baker & Quinn, 2018; Passaro, Harbarth, & Landelle, 2016).

There are many unintended adverse consequences of missed oral care including HAP which frequently leads to sepsis, increased length of stay, higher costs, and decreased quality of life. Antibiotic resistance is on the rise which complicates this picture as well. Since there are no formalized tracking requirements currently in place by regulatory or accreditation agencies, many hospitals are unaware of the extent of the problem and potential harm to patients. Like most healthcare facilities in the U.S., the Salem VA Medical Center (VAMC) was initially unaware of its rate of NV-HAP. In addition, missed nursing care, including oral care, is a challenge in hospitals nation-wide, including VA hospitals (Kalisch, Xie, & Dabney, 2014). Due to the modifiable risk reduction oral care provides, a series of pilot studies were undertaken at the VA to determine feasibility and the effect of the intervention on HAP among non-ventilated patients.

3. Methods

3.1. Implementation of the VA oral care initiative

Implementation of oral care aimed at NV-HAP at the pilot site, Salem VAMC, was guided by the Influencer Model ™ and participatory action research. The pilot study was modeled after the successful reduction of NV-HAP with oral care implementation reported by Quinn et al. (2014) for Sutter Medical Center, Sacramento, CA.

Because there is a great divide between learning and actual performance, participatory action research was used to engage and motivate VA staff throughout the pilot study from planning to evaluation. VA staff were fully engaged in the project to develop functional meaning and outcomes for staff, patients, and families (Abrams, Emmons, & Linnan, 1997).

3.2. Aim

The aim of the VA pilot study was to: (1) determine the effectiveness of oral care to reduce the incidence of NV-HAP on the participating units, and (2) ascertain the cost avoidance through prevention of NV-HAP cases.

3.3. Setting

The Veterans Health Administration (VHA) is the nation's largest integrated health care system. VHA is organized into 21 regional districts that manage care for > 8.3 million Veterans in 153 medical centers and > 1400 community based outpatient clinics, community living centers, and domiciliary residential rehabilitation treatment programs.

Due to the complex health care needs, high rates of mental health issues, substance dependence, financial challenges and homelessness that many Veterans face, they are considered a vulnerable population (O'Toole, Johnson, Aiello, Kane, & Page, 2016). Veterans often utilize the VA health system when they are unable to access or afford care elsewhere and are more likely to be diagnosed with multiple chronic diseases, have a lower income, and are less able to afford their medications (O'Toole et al.). The population on the Community Living Center (CLC) units, the first VA pilot site, is primarily comprised of elderly Veterans with complex chronic health problems such as end stage dementia, stroke, and many are receiving hospice or palliative care. A smaller number of Veterans on the pilot units participate in rehabilitation post hip or knee replacement.

There was no recruitment for this Institutional Review Board approved study (SCM0009) as it was necessary to follow all hospital admissions and imperative that researchers acquired information regarding all cases of NV-HAP. Inclusion criteria for the pilot study were all male and female Veterans of any age, race, or ethnicity who were admitted during the study time-period. There were no exclusion criteria on the pilot units.

3.4. Materials and staff education

Prior to this study and based on a gap analysis, the pilot site lacked clear guidelines on prevention of NV-HAP; oral care was not provided or documented consistently outside of the intensive care units, and current educational materials did not address oral care. In addition, oral care supplies available prior to the start of the pilot were not American Dental Association (ADA) approved and were not consistently stocked on the units. Therefore, the first step included developing a multidisciplinary team to design an action plan which involved procuring high quality ADA approved oral care supplies, improving nursing documentation templates, selecting nurse champions and interdisciplinary team members, beginning regular monitoring, and producing an audit feedback loop (Mauger et al., 2014) (Fig. 1).