

**Implementing an Oral Care Protocol in a Hospital Setting to Reduce Non-Ventilator
Hospital Acquired Pneumonia**

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Introduction

Purpose and Aims of the Project

The purpose of this project was to implement an oral care protocol within a hospital setting, focusing on all adult inpatient units, excluding labor and delivery and psychiatric units. The interaction between main risk factors of oral microbiota, aspiration, and patient condition has potential to create the opportune atmosphere for hospital acquired pneumonia (HAP) to develop. Of those main risk factors, oral microbiota was most capable of being modified (Ewan, Sails, Walls, Rushton, & Newton, 2015). Additional goals of the DNP student project included dissemination of knowledge learned from project implementation and sustainability of the oral care protocol. The aim of this project was to reduce the amount of patient occurrences of non-ventilator hospital acquired pneumonia (NV-HAP).

Background and Significance of the Problem

Hospital-acquired infections (HAI) are a problem faced by facilities globally and known to be costly in many aspects. Costs associated with HAI include increased inpatient days, re-admissions, along with higher morbidity and mortality rates (Rhamqvist, Sameulsson, Bastami, & Rutberg, 2016). Hospital acquired pneumonia accounted for over 21% of all hospital-acquired infections in 2011, making it a significant concern (Giuliano, Baker, & Quinn, 2018). While most data and surveillance has historically focused on ventilator acquired pneumonia (VAP), 60.9% of all HAP was classified as NV-HAP in 2011 (Giuliano et al., 2018). Even with this rate

of prevalence, there is little recognition, research, and surveillance of non-ventilator acquired pneumonia.

Pneumonia is diagnosed based on clinical criteria through radiograph, patient symptoms, and lab values which include blood or sputum. A chest x-ray will show a new or progressing pulmonary infiltrate (Ranzani et al., 2019). The chest x-ray in conjunction with at least two of the following symptoms: temperature of $>38^{\circ}\text{C}$ or $<36^{\circ}\text{C}$, leukocytosis $> 12,000/\text{mm}^3$ or leukopenia $<4,000/\text{mm}^3$ or purulent respiratory secretions are used to diagnose pneumonia (Ranzani et al., 2019). While these guidelines are used to diagnose pneumonia in any setting, additional criteria is needed for HAP. According to the 2016 clinical practice guidelines by the Infectious Diseases Society of America and the American Thoracic Society, Kalil et al. (2016), HAP is defined as pneumonia that occurs 48 hours or more after admission. Hospital acquired pneumonia can be considered an overarching term for all hospital acquired pneumonia regardless of mechanical ventilator status. Ventilator acquired pneumonia is used to define pneumonia occurring >48 hours after endotracheal intubation (Kalil et al., 2016). As NV-HAP was the focus of this project, NV-HAP has been defined as episodes of HAP not associated with mechanical ventilation. ICD-10 codes along with chart review were used to provide data regarding HAP and NV-HAP.

Etiology of HAP is often bacterial related. Quinn and Baker (2015), observed bacteria found in dental plaque and its direct pathway from the oral cavity to the lung tissue have been determined to be a causative factor in HAP. The human mouth houses an estimated 700 different bacterial species which work together to maintain a balanced ecosystem (Chen et al., 2018). However, the balanced oral cavity ecosystem can be disrupted by alterations in diet, oral care habits, and an individual's overall health (Chen et al., 2018). There are three major groups of risk

factors that in combination, contribute to the development of HAP (Ewan et al., 2015). Those groups include: present oral microbiota, aspiration potential related to dysphagia and reduced conscious level, along with host factors such as, age, frailty, and comorbidity (Ewan et al., 2015). Isolated pathogens which most frequently cause HAP include: *Pseudomonas aeruginosa*, Methicillin resistant staphylococcus aureus, Methicillin susceptible staphylococcus aureus, Enterobacter, *Klebsiella pneumoniae*, *Escherichia coli*, *Serratia marcescens*, and *Proteus* species (Imran, Amjad, & Haidri, 2016). These harmful pathogens are not typical of oral flora and can be introduced from the environment to the oral cavity through drinking contaminated water or hand to mouth contact. Replication of the harmful pathogens is rapid with the amount of gram-negative bacteria tripling on the tooth surface every 3-6 hours (Warren, Medei, Wood, & Schutte, 2019). According to Imran et al.(2016), pathogenesis can be due to aspiration or inhalation of aerosolized particles containing the bacteria. Quinn and Baker (2015), further assert aspiration is also cited as a causative factor and in conjunction with high amounts of oral bacteria due to poor oral hygiene, risk for hospital acquired pneumonia is elevated.

Hospital acquired pneumonia can affect a patient at any age from the neonatal population to the frail elderly. According to the retrospective observational study by Uvizl, Kolar, Herkel, Vobrova, and Langova (2017), the average age of HAP is 63 years and most likely to be male. The Acute Physiology and Chronic Health Evaluation (APACHE) II, a scoring system predominantly used within intensive care units (ICU) to determine severity of illness, was also considered when measuring those with HAP. The average APACHE II score for HAP was 21.4 (Uvizl et al., 2017). Those with HAP are more likely to have comorbidities, which may further exacerbate the problem. Comorbidities to increase risk for HAP include: chronic lung disease, decreased level of consciousness, recent chest or upper abdominal surgery, previous antibiotic

exposure primarily broad spectrum, total opioid exposure, trauma, paralysis, and malnutrition (Uvizl et al., 2017).

Oral hygiene is a feasible option to manage the bacterial burden in the oral cavity. However, hospitalized patients are likely to experience an alteration in their daily hygiene routines leading to decreased oral hygiene. Alterations may be attributed to patient illness in which a patient may lack the energy or desire to perform self-cares (Quinn & Baker, 2015). Having access to oral care supplies is imperative for both patients and nursing. The American Dental Association (ADA) recommends use of the following supplies: soft bristled toothbrushes, alcohol-free antiseptic rinse, therapeutic toothpaste, petroleum-free lip moisturizer, denture-care products, and suction equipment for those patients at risk of aspiration (ADA, 2019). When oral care supplies are substandard or not easily accessible to the patient or nurse, opportunities for oral hygiene are further diminished. Missed nursing care through patient education about the importance of oral hygiene and providing oral care to those who are dependent on basic cares further exacerbate alterations in daily hygiene. A survey by Quinn & Baker (2015) suggests that while nurses understand the importance of oral care as a comfort measure, they do not recognize the risk for pneumonia in relation to missed oral care. Quinn & Baker (2015), also discovered that within 24 hours before a NV-HAP diagnosis, oral care was found to be undocumented 73% of the time. This shows the bacterial burden in the oral cavity has not been adequately managed by insufficient oral care in the hospital by both patient and nursing.

Gaps in nursing practice related to oral care in the hospital setting exist through lack of a standardized oral care protocol, access to ADA recommended oral care supplies, and knowledge of oral care as a preventative measure against pneumonia (Quinn & Baker, 2015). According to data gathered from a hospital located in northern Illinois, there were 48 cases of NV-HAP during

2018-2019. The estimated costs associated with NV-HAP for SAH were \$1,920,000. The average length of stay for a patient at this hospital in 2018-2019 was 4.421 days. The length of stay was increased to 14.75 for those with HAP and for those patients with HAP that developed sepsis, the length of stay increased to an additional 6 days. Patients with HAP were at an increased risk of developing sepsis and death. Of the 48 patients with HAP, 3 of those patients developed sepsis and 8 patients with HAP passed away.

Relationship of the Project to Advanced Nursing Practice and DNP Essentials

Implementing an oral care protocol within a hospital setting is a project supported by many of the American Association of Colleges of Nursing (AACN) Doctor of Nursing Practice Essentials. Key Doctor of Nursing Practice (DNP) Essentials that directly support this project included: I, II, III, IV, VI, VII, and VIII. The implementation of this project was supported by DNP Essential I: *Scientific Underpinnings for Practice*, based on evidence acknowledging a link between oral bacteria and its passage to lung tissue, causing infection. The proposed setting for implementing the project encompassed all adult inpatient units which offer a variety of specialized services and cares. DNP Essential II: *Organizational and Systems Leadership for Quality Improvement and Systems Thinking*, recognizes the complexity of implementing a nursing practice change for an entire population of patients on multiple units within a hospital setting. The translation of research to practice was supported by DNP Essential III: *Clinical Scholarship and Analytical Methods for Evidence-Based Practice*. An oral care protocol corroborated by evidence-based practice was implemented. DNP Essential IV: *Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care* entailed utilization of the hospital's EMR, Health link to document oral care provided by nursing. Nursing documentation served as a means to evaluate compliance of care

through reports. Chart audits for patients with an ICD-10 diagnosis code provided data to measure outcomes. An oral care subcommittee, comprising staff nurses, nursing management, patient care technicians, speech therapists, and infection preventionists, lead by this DNP student was formed to obtain baseline data and develop an action plan. Additional collaboration with supply chain, purchasing, and the Value Analysis Team (VAT) was needed in order to mobilize supplies. Collaboration with Quality, Nursing Professional Development Specialists, and Shared Governance Councils facilitated evaluation and continued monitoring which will foster sustainability in the practice change. All collaboration efforts were supported by DNP Essential VI: *Interprofessional Collaboration for Improving Patient and Population Health Outcomes*. The outcome of the project implementation was a reduction in NV-HAP for the adult inpatient population. Evaluation of the outcome after delivery of care and continued surveillance was supported by DNP Essential VII: *Clinical Prevention and Population Health for Improving the Nation's Health*. Oral care is a basic hygiene measure that is fundamental to nursing care. However, oral health during hospitalization tends to deteriorate as it can become a lower priority with other care related tasks (Quinn & Baker, 2015). DNP Essential VIII: *Advanced Nursing Practice*, focuses on conducting a needs assessment and mentoring nurses. A gap in practice has been identified and a needs assessment was completed. Education has been provided to nursing staff in order to improve nursing practice to achieve better patient outcomes.

Practice Setting and Target Population

The target population for this project included all adult inpatient units within a teaching, located in Rockford, IL. Project site is a 333-bed, full service, non-profit hospital that serves the greater Rockford area, northern Illinois, and southern Wisconsin. There are 6 inpatient units for adults ages 18 and over within the hospital with 268 adult inpatient beds. Specialty services

rendered on these units include: critical care, step-down critical care, stroke and cardiac surveillance care, medical/surgical, orthopedic/neurology, and oncology. Their mission is “through excellence in healthcare and compassionate service, we care for our community” (SwedishAmerican, 2020).

The majority of the patients treated this facility reside in Rockford, IL and within the 61104 zip code. Poverty is listed as an area of concern for this patient population, meaning many patients present to the hospital with poor dentition and evidence of poor oral health (Swedish American, 2019). Disturbingly, oral health is not a priority among Illinois residents, further compounding their risk for developing NV-HAP when they present for hospital services (personal communication, Juanita Graham DNP-RN, Public Health Nursing Consultant, March 5, 2020). According to the most recent Centers for Disease Control and Prevention data, around 35% of Illinois adults aged 18 years and older report not having visited a dentist or dental clinic within the last year, and possibly never (CDC, 2016). Among Illinois adults aged 67 years and older, more than 13% report having lost all of their natural teeth due to tooth decay or gum disease and more than 37% report having lost at least six or more teeth due to tooth decay or gum disease (CDC, 2016). These percentages escalate in the lower socioeconomic areas of Rockford and Winnebago County. The County Health Rankings system ranks Winnebago County’s overall health snapshot as 89th among the 102 Illinois counties (UWPHI, 2019). Notably, the Winnebago County health rankings show that 17% of Winnebago residents report only poor to fair health status, and 18% are current smokers, a significant risk factor for poor oral health (UWPHI, 2019).

Project Alignment With Practice Mission & Practice Setting Support

Permission to proceed with this project was granted from the Chief Nursing Officer (CNO) of the facility. Support for this project was shown by permitting the development of an oral care subcommittee. Conference room space was provided for meetings along with a secretary to record minutes. Meetings with the hospital's Value Analysis Team (VAT) were held in order to evaluate and mobilize supplies. Current patient toothbrushes were found to be of poor quality with bristles easily falling out or flattening. Through collaboration between the oral care subcommittee and VAT, the patient toothbrushes were upgraded to a better quality soft bristle toothbrush.

The nursing care model followed at the facility (Appendix A) is Joanne Duffy's Quality Caring Model (Swedish American Hospital, 2020). Joanne Duffy's Quality Caring Model (QCM) blends the human caring and relationship building components which are integral to nursing with the measurable outcomes providing evidence of quality of care (Duffy & Hoskins, 2003). Implementing an oral care protocol ensured the patient's basic hygiene needs were met, promoted a healing environment, and promoted patient dignity, offering outcomes that were measurable to improve the quality of nursing care.

Key Stakeholders

A meeting was held by the Oral Care Subcommittee to identify key stakeholders with implementing an oral care protocol. These were individuals or groups who had either direct impact on, were affected by, or had an interest in the overall outcome of the proposed implementation. Those identified groups of stakeholders included: the customer, the employees, the hospital board, product suppliers, and the community. (Appendix B) denotes how each group of stakeholders related to the proposed implementation. For this project, the customer is the patient who was directly affected by the oral care protocol. Employees included: staff registered

nurses, nurse managers, chief nursing officer, nurse informatics, nursing educators, nursing quality, patient care technicians, infectious disease, speech therapy, physicians, supply chain, dietary, respiratory therapy, and occupational therapy. All employees that fell into the aforementioned groups played a role in this implementation through education, direct patient care, monitoring for compliance as well as upholding accountability, procuring supplies, and surveillance of patient outcomes. Depending on their role, some employees had a direct impact on the implementation while others had an interest in the outcome. As cost of NV-HAP impacts the overall financial status of the hospital, the hospital board had an interest in the overall outcome of the implementation. Product suppliers had a direct impact as well as had been affected by the implementation through their products by ensuring quality and availability of supplies. Finally, the community, which consists of patients' friends and families also had an interest in the overall outcomes.

Benefit of the Project to the Practice Site

Hospital acquired pneumonia is costly and holds a significant financial consequence for the hospital in which it occurs. The most evident benefit of implementing an oral care protocol at the selected hospital is a cost avoidance of approximately \$1,920,000 annually based on the 48 cases of HAP from 2018-2019 data. The patient length of stay would be not be increased, thus providing more patient access to hospital services through open beds. Fewer resources to treat HAP, including medications and critical care services would be needed. As HAP can lead to hospital re-admissions Rhamqvistet al. (2016), a reduction in HAP incidence can improve the hospital's quality indicators through lower re-admissions rates.

Needs Assessment

The impact of a NV-HAP was high for both patient and facility. Financial burdens experienced by facilities with an occurrence of HAP include increased length of stay as well as added associated costs. Giuliano et al. (2018) estimated the average cost of a NV-HAP to be \$39,897. In order to obtain baseline data, an audit was completed of adult inpatient charts, excluding labor and delivery, from 2018-2019 with ICD-10 codes to include the diagnosis of pneumonia occurring >48 hours after admission. According to data gathered from the audits, there were 48 cases of NV-HAP. The estimated costs associated with NV-HAP for this facility were \$1,920,000. The average length of stay for a patient at this hospital in 2018-2019 was 4.421 days. The length of stay was increased to 14.75 for those with HAP and for those patients with HAP that developed sepsis, the length of stay increased to an additional 6 days. Patients with HAP were at an increased risk of developing sepsis and death. Of the 48 patients with HAP, 3 of those patients developed sepsis and 8 patients with HAP passed away.

Of factors contributing to HAP, the most modifiable risk factor was the need to reduce the bacterial load in the patient's oral cavity (Ewan et al., 2015). Patients with poor dentition and oral health may be at even higher risk for NV-HAP as they present for hospitalization. CDC data shows, around 35% of Illinois adults aged 18 years and older report not having visited a dentist or dental clinic within the last year, and possibly never (CDC, 2016). More than 13% of Illinois adults aged 67 years and older report having lost all of their natural teeth due to tooth decay or gum disease and more than 37% report having lost at least six or more teeth due to tooth decay or gum disease (CDC, 2016). Current oral care practice at the selected facility was evaluated. A search through the facility's policies and procedures showed there was no standard oral care policy or protocol in place to provide staff with recommendations for oral hygiene. The ADA recommends brushing for 2 minutes or 30 seconds in each quadrant of the mouth in order to

achieve a larger decrease in plaque (ADA, 2019). The American Association of Critical Care Nurses (AACN) provides the following oral care recommendations for non-ventilated patients: encourage patients able to provide independent self-care to brush teeth four times/day after each meal and before bedtime; patients unable to manage own oral care or secretions should receive oral care four times/day after each meal and before bedtime or every 6 hours if NPO (Wiegand, 2017).

In order to examine basic oral care practice, 311 rooms were checked to see if oral care supplies, a toothbrush and oral rinse, were present in the room. Results showed 34% of patient rooms did not have a toothbrush in the room and 56% did not have oral rinse in the room. Of those rooms with supplies present, further evaluation regarding usage was obtained by either observation of an unopened package or by questioning the patient. Overall findings of the baseline assessment showed 88% of patients either did not have a toothbrush or oral rinse or had them but did not use them. A baseline survey monkey to evaluate nursing knowledge was distributed to inpatient nursing staff on behalf of the oral care committee as a needs assessment (Appendix C). The baseline data suggested inconsistent oral care provision due to inaccessible or unavailable oral care supplies, possible low priority with nursing staff, and a lack of a standardized oral care protocol.

Literature Review

Search Strategy and Criteria

A literature review was conducted to evaluate the relationship between non-ventilator associated hospital acquired pneumonia and current nursing practice of oral hygiene within the hospital setting. Research was conducted through Purdue University Global library. Keywords included: oral hygiene, oral care, nursing care, hospital acquired pneumonia, and non-ventilator

hospital acquired pneumonia. Ventilator acquired pneumonia was excluded. Additional search criteria included dates of literature between 2015 and 2020. An initial search in the Cochrane Library did not yield results. Both CINAHL and MEDLINE databases were utilized.

Levels of Evidence

Literature was evaluated using the Evidence Pyramid and Levels of Evidence and Grades of Recommendations (Appendices D & E). A literature synthesis including levels of evidence was completed (Appendix F).

Literature Synthesis

Introduction

Hospital acquired pneumonia (HAP) is one of the most common causes of nosocomial infections and occurs in 5 to 10 patients out of 1,000 admitted hospital patients (Di Pasquale et al., 2016; Ewan et al., 2015; Kanzigg & Hunt, 2016). Hospitals are burdened with increased expenses to treat along with increased use of resources. Patients experience higher mortality risk, increased hospital length of stay, and functional decline (Ewan et al., 2015; Klein et al., 2017). Depending on causative pathogen and patient underlying conditions, mortality rates for HAP range from 20%-70%, making it the most frequent cause of death among nosocomial infections worldwide (Di Pasquale et al., 2016).

Hospital acquired pneumonia is a pneumonia that occurs >48 hours after hospital admission with criteria for diagnosis including: new infiltrates found on a chest x-ray, and 2 of the following: fever >38°C, leukocytosis or leukopenia, and purulent respiratory secretions (Di Pasquale et al., 2016; Ewan et al., 2015). However, there is controversy with current diagnosis criteria as it is neither sensitive nor specific, potentially leading to misdiagnosis (Di Pasquale et al., 2016). HAP includes both ventilator associated pneumonia

(VAP) and non-ventilator associated pneumonia (NV-HAP). This review will focus on NV-HAP.

Etiology

The cause of NV-HAP is most often bacterial with aspiration of bacteria colonizing the oral cavity into the lungs being considered the primary mechanism of action (Ewan et al., 2015; Hong et al., 2017; Jenson, Maddux, & Waldo, 2018). The oral cavity serves as a reservoir for infection as there are hundreds of microbial species found (Hong et al., 2017). Plaque and biofilm accumulation houses the bacteria, indicating those with poor oral care would have a larger bacterial load found within the oral cavity. A shift in bacterial flora to Gram-negative bacilli can occur days after hospitalization (Di Pasquale et al., 2016; Jenson et al., 2018). This shift is more prominent for those with severe illness, malnourishment, use of antibiotic therapy, and advanced age combined with poor oral care, create an optimal environment for pathogenic bacteria to grow in the oral cavity (Di Pasquale et al., 2016; Ewan et al., 2015). Pathogens known to cause NV-HAP include: *Acinetobacter baumannii*, *Haemophilus influenzae*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, and *Escherichia coli* (Ewan et al., 2015; Hong et al., 2017; Kanzigg & Hunt, 2016).

Risk Factors

Key factors which increase the risk for developing HAP come from oral microbiota, aspiration potential, and a weakened host (Ewan et al., 2015; Kanzigg & Hunt, 2016). Gender and age play a role in risk with elderly men being at higher risk (Danckert, Ryan, Plummer, & Williams, 2016; Kanzigg & Hunt, 2016). Patients with comorbidities including: chronic obstructive pulmonary disease (COPD), tracheostomy or cranial trauma, recent neurological, thoracic, or abdominal surgery, acute respiratory distress, multiple organ system failure, cerebral

palsy, weakened immune system, use of proton pump inhibitors, previous antibiotic treatment, and impaired consciousness are also at higher risk for developing HAP (Di Pasquale et al., 2016; Kanzigg & Hunt, 2016). Di Pasquale et al. (2016) identifies a potential link between nutritional status and HAP based on serum albumin levels. Those with a higher potential to aspirate are at risk for HAP. Impaired swallow reflexes promote an environment that fosters the growth of opportunistic harmful pathogens (Ewan et al., 2015). The decreased mechanical clearance of the mouth raises the likelihood for aspiration (Ewan et al., 2015). Dysphagia, decreased salivary flow, and depressed cough or gag reflex also contribute to the risk for aspiration (Kanzigg & Hunt, 2016). Patient factors and aspiration potential are both viewed as non-modifiable factors. Out of all the risk factors, oral microbiota is considered to be the most modifiable factor. Increased plaque or biofilm can further increase the risk of HAP (Danckert et al., 2016; Ewan et al., 2015; Hong et al., 2017; Kanzigg & Hunt, 2016). Hospitalization and physical limitations from illness can affect a patient's ability to maintain their oral self-care (Rajan, Devi, Thomas, Mamatha, & Williams, 2018).

Prevention

Oral care is a key part in the prevention of hospital-acquired infections (Klein et al., 2017). Poor oral health further impacts an individual's overall health status and is associated with difficulties in swallowing, poor nutritional intake, decreased speech clarity, and infections (Danckert et al., 2016). Kanzigg and Hunt (2016) found when proper oral hygiene was used, the absolute risk of respiratory illness was reduced to 6.6-11.7% of all HAP patients. However, other studies have shown changes in oral care to not to have had a strong effect on HAP rates (Ewan et al., 2015; Hong et al., 2017). One could question if changing a single factor yielded a limited effect on HAP rates because there are multiple contributing factors. Most

evidence has been based on ventilated patients within the ICU setting with limited data gathered from non-ventilated patients (Di Pasquale et al., 2016). This means prevention strategies for NV-HAP have been developed from VAP prevention strategies.

There has been no established optimal frequency for the provision of oral care within a hospital setting. The oral care interventions described in the reviewed studies varied. Kiyoshi-Teo and Blegen (2015) cites the American Association of Critical Care Nurses (AACN) guidelines of brushing teeth and gums along with using mouth rinse at least twice daily and to moisturize oral mucosa and lips every 2 to 4 hours. Kiyoshi-Teo and Blegen (2015) further notes oral swabbing, while providing comfort, does not physically remove dental plaque as effectively as toothbrushing. Other studies found toothbrushing four times per day resulted in a decrease in HAP (Ewan et al., 2015). Jenson et al. (2018) utilized an oral hygiene protocol which provided oral care four times daily using a combination of toothbrushing alternating with oral swabbing. In addition to lack of optimal frequency, there is little guidance to the technique for oral care. The study by Hong et al. (2017) suggests attention should be paid brushing the tongue to mechanically remove biofilm and therefore reducing pneumonia development from oral sources.

Current Practice

Oral care is an essential nursing care and considered important in the prevention of HAP, yet there is variance in current practice. Patient's ability to provide their own oral hygiene can be altered within the hospital setting, making it necessary for nursing to assess patient's need for assistance with oral cares (Danckert et al., 2016). Rajan et al. (2018) found an estimated 44-65% of hospitalized adults patients dependent on cares did not receive adequate oral care. Rajan et al. (2018) and Klein et al. (2017) assert nurses have understanding of the importance of good oral

care but this knowledge is not being incorporated into practice. Barriers to adequate oral health include: lack of oral care protocols, variability in oral care knowledge among nurses and care staff, low priority compared to other nursing tasks, limited time, resource constraints, and challenging patient behaviors (Jenson et al., 2018; Klein et al., 2017; Luong et al., 2017; Rajan et al., 2018). Many nurses report not having an oral hygiene protocol within their institution, giving reason for omitted oral care (Jenson et al., 2018; Kiyoshi-Teo & Blegen, 2015; Klein et al., 2017). For those institutions that have an oral care protocol, understanding of available oral hygiene guidelines is not always consistent, leading to varying adherence in care (Kiyoshi-Teo & Blegen, 2015). Nursing staff education regarding oral hygiene has been found to be beneficial for better understanding of its importance and in turn, making it a higher priority of care (Jenson et al., 2018; Klein et al., 2017; Rajan et al., 2018). Hospital environment plays a role in oral care practice with access to oral care supplies prompting Danckert et al. (2016) to suggest priority should be given to access of supplies.

Theoretical Foundation

Joanne Duffy's Quality Care Model

Joanne Duffy's Quality-Caring Model (QCM) is the conceptual framework that was used for this project. It has long been established that caring is a cornerstone of nursing practice. Caring in nursing occurs in two fundamental ways with one way being the act of caring for another person who cannot care for themselves and the other way as a means to describe the actions of a nurse (Adams, 2016). Duffy recognizes the need for evidence to quantify the caring processes in nursing as a means to measure and improve health care outcomes (Duffy & Hoskins, 2003). The QCM blends nursing contributions to quality care with evidence-based

practice. This blending is done through integrating the biomedical and psychosociospiritual factors that are associated with quality health care as well as the underlying philosophical belief that persons are viewed *in relation to* and interdependent with others (Duffy & Hoskins, 2003).

The QCM is an outcomes-based model that seeks evidence to show that the care provided benefits patients and families. Three key components of the QCM are structure, process, and outcomes. Structure refers to the concepts, participants, and the factors that are present before the delivery of health care, including: the patient/family, various health care providers, and the health care system (Duffy & Hoskins, 2003). Within each participant, the unique characteristics and attributes are identified. These unique characteristics and attributes of a participant can influence the process of care and may also influence the outcome of care. Process involves the interventions that are provided and is made of two categories: technical and interpersonal (Duffy & Hoskins, 2003). Caring relationships are at the core of the QCM process citing both relationships with patients/families as well as collaborative relationships with the health care team. Outcomes is future based and refers to the end results of the health care provided (Duffy & Hoskins, 2003). Outcomes consist of intermediate outcomes and terminal outcomes. Intermediate outcomes can be appreciated through observed changes in a patient/family's behavior, emotions, or knowledge to influence end result outcomes. Terminal outcomes are big picture, end result outcomes that affect quality of life, health care costs, disease-specific variables, and satisfaction of care, which can impact a health care institution's capability to prosper (Duffy & Hoskins, 2003). The key components of QCM are not viewed as a linear process but as a dynamic cycle of continuously interacting, providing feedback, and changing based on time and circumstance.

Implementing an oral care protocol is described as a quality improvement project, making Duffy's QCM a logical choice to be used as a conceptual framework. In addition, this is the nursing care model used at the selected location of the project. Using the same nursing theoretical model as selected facility shown in (Appendix A) also showed alignment of project with facility.

This project considered the components of structure of patients, nursing, facility, and other stakeholders, process of oral cares provided, and the outcome of a reduction of NV-HAP. As the QCM was described, these components will be an interacting dynamic cycle based on time and circumstance. Structure participants of patient, nursing, and facility structures influenced process and outcomes. For example, the patient's comorbidities, nursing knowledge of oral care, and facility culture impacted both process and outcomes. These participants were considered dynamic as patients are individuals with unique backgrounds and needs, nursing knowledge changes as they gain knowledge and as new nurses are employed, and facility culture changes as priorities and interests change. Much of the project focused on the process which is also the focus of the QCM model. The process is the intervention of implementing an oral care protocol. Outcomes were evaluated with intermediate outcomes being recognized by changes in patient and nursing behaviors and knowledge regarding oral cares. The goal of these changes was to influence end result outcomes with lower NV-HAP rates at the facility. Terminal outcomes included the end result outcome along with reduced health care costs, improved overall patient health outcomes as well as patient satisfaction.

Lewin's Change Theory

Lewin's Change Theory was applicable to the project as an overall nursing culture change was required for the successful implementation and sustenance of the oral care protocol.

The three main parts to Lewin's Change Theory involve unfreezing, change, and refreezing. For this project, current nursing practices and cultural attitudes regarding oral care being seen as a low priority compared to other nursing cares or as a comfort measure needed to be unfrozen. The change involved the implementation of the oral care protocol. This change also included nursing staff education about the importance of oral care along with procuring high quality oral care supplies. Once the changes through the intervention was made, refreezing could occur. The refreezing part of Lewin's Change Theory focused on sustaining the new practice. In order to sustain the change in practice, chart audits as well as surveillance of incidence of NV-HAP will be completed regularly. Initially, the audits and surveillance should be done on a more frequent basis. Nursing education regarding the importance of oral care has been woven into new nursing orientation.

The literature reviewed supported the DNP student project to implement an oral care protocol in the hospital setting. Multiple articles identified oral care as a preventative measure to reduce risk for HAP and NV-HAP. Studies found nursing practice in oral care varies, leading to hospitalized patients receiving inadequate oral hygiene. The variance in practice highlighted a need for the development of an evidence based oral care protocol. The need for nursing education was found to be an important part of implementing an oral care protocol. Based on this project's use of evidence to support quality improvement in nursing practice, Joanne Duffy's QCM is a logical choice for a conceptual framework to guide this project. Lewin's change theory was used to address the variance in nursing practice and leading nurses to a standardized practice.

Project Description

Project Summary and Outcomes

An oral care protocol has been implemented in the hospital setting for all adult in-patient units excluding labor and delivery along with psychiatric units. Expected project outcomes were to improve the current oral care practice provided. This outcome was directly measured by review of nursing documentation in the hospital electronic health record (EHR). Increased compliance with oral care post implementation of the protocol illustrated the efficacy of the oral care protocol. An expected patient outcome was a reduction of patients developing NV-HAP. An indirect measurement of this outcome was through a comparison of ICD-10 codes which showed NV-HAP before and after the intervention to determine if the overall goal was achieved. The link between oral care and NV-HAP would be further strengthened if rates of NV-HAP decrease after an increase in oral care compliance post intervention is shown.

Project Timeline

The initial idea of this project began in April 2019 after surveys of current oral care practices and nursing knowledge were completed. The results helped to identify a need for change leading to the development of an ad-hoc oral care subcommittee. The actions of this project took place over an 18-month period based on the DNP student's degree plan starting in January 2020 with developing a project proposal until June 2021 with completion and dissemination of the final project (Appendix G). Because of unforeseen circumstances related to the Coronavirus Disease of 2019 (COVID-19) pandemic, key phases of implementation were delayed until February 2021.

Project Budget: Justification and Cost/Benefit Analysis

Considerations for budget involved direct and indirect costs. While there were changes in current oral care products, an increase in usage affected product expenses. An oral care prevalence survey completed in 2019 that included 311 patient rooms showed 34% patient rooms

did not have a toothbrush and 56% patient rooms did not have oral rinse. The total cost of oral care supplies for each patient is approximately \$0.63. Supplies for a patient independent with cares includes: a soft bristle toothbrush, toothpaste, oral rinse, and lip moisturizer. For those patients who cannot expectorate, follow commands, or dependent on oral cares, additional supplies may include a suction toothbrush with tubing and oral swabs. Additional supplies for those dependent in oral care was estimated to be an additional \$1.02. In 2019, the facility's VAT reported \$10,849 was spent on oral care products. It was expected that direct costs of increased usage of oral care supplies would occur with the intervention of implementing an oral care protocol. Additional direct costs for this project included education materials. Posters were provided to each unit to be displayed in the unit break room as a means to reinforce staff education. A laminated sign was displayed in each patient room to reinforce patient and family education. Estimated costs of rights to stock images, paper supplies, and printing for this project was \$500.00. Indirect costs of this project included operational costs of staff time. An oral care committee has been developed and composed of 4 registered nurses, 1 patient care technician, 2 infection preventionists, 1 speech therapist, and this DNP student. The oral care committee initially met monthly for an hour long meeting at the start of the project. As COVID-19 affected the facility, in-person meetings were halted and much work was completed through virtual meetings or emails. Staff wages during this meeting time would need to be considered as indirectly adding to the cost of the project. Based on average national salaries, 12 monthly hour long meetings will cost approximately \$3,120 (US Bureau of Labor Statistics, 2019).

Project Implementation

Project Implementation

An oral care protocol was developed for the hospital based on evidence gathered from a literature review (Appendix H). There were multiple parts to implementing the oral care protocol which included nursing practice change and incorporating needed patient care supplies. A step-by-step process was developed for the Department of Veterans Affairs by Munro et al (2018) to include 5 key steps for implementation and dissemination of an oral care protocol. These steps included: preparing the foundation and mobilizing supplies; customizing nursing documentation templates, data collection tools, and patient education; nursing staff training; implementing the protocol; and evaluation (Munro et al, 2018). This project's implementation strategies were based on Munro's process.

The initial step toward implementing an oral care plan involved preparing the foundation and mobilizing supplies. This took a team based, multidisciplinary approach and included leadership as well as frontline staff who provide direct patient care. The champion or leader of this implementation was the DNP student. The champion was responsible for implementing, coordinating the multidisciplinary team, documentation audits, evaluation, and sustaining practice (Munro et al, 2018). A needs assessment was completed by obtaining baseline data regarding current NV-HAP rates along with determining current oral care practices. In addition, stakeholders were identified. Understanding both current practices and acknowledging stakeholders provided valuable information regarding potential barriers and how to navigate around them. Data gathered from the needs assessment was presented to nursing administration and support from facility's Chief Nursing Officer was given to proceed with the project.

A key piece of this implementation included patient care supplies. Munro et al (2018) asserted careful attention must be made to obtaining, distributing, stocking, and storing supplies. In order to provide high quality oral care, the following supplies were needed: therapeutic

toothpaste, non-alcoholic antiseptic mouth rinse, soft bristle toothbrush, non-petroleum mouth moisturizer, and suction for those unable to swallow or expectorate (Wiegand, 2017). A meeting with supply chain and VAT occurred to review current supplies and evaluate for need to change. One change in the oral care products resulting from that meeting was an upgrade to a better quality soft bristle toothbrush.

Collaboration was required between the oral care team and clinical informatics to create and integrate a template for documenting oral care within the EMR (Munro et al, 2018). Healthlink is the EHR used at the facility. Nursing staff already could document the oral cares they provided and therefore no changes to present documentation were required. Documentation for oral care is found in the nursing flow sheets under the Daily Care tab. Oral care documentation is listed under Activities of Daily Living (ADL). Nurses can document the following regarding oral cares provided: oral care (mouth swab, oral suction, moisturizer), brushed teeth with oral care (mouth swab, oral suction, moisturizer), denture care, done before admission, gum care, lip moisturizer, mouth suctioned, mouth swabbed, mouth swabbed with CHG, mouthwash, normal saline rinse, patient declined, teeth brushed, unable per MD order, and a free text option. A report showing nursing documentation of oral cares provided within the past 24 hours was developed to function as an auditing tool. The report showed all oral care provided as well as patients who refused oral care. Lack of documentation indicated no oral care was provided to the patient. Data collected during the audits was shared with nurse managers and leadership each week after the implementation to provide a weekly score card of oral care practice on a hospital-wide basis as well as broken down by each unit. These weekly reports helped to promote accountability and facilitate an environment for feedback on the implementation process.

Customizing Patient education materials was the next phase in order to foster an understanding of the importance of oral care to prevent hospital acquired pneumonia. Education materials consisted of flyers which were laminated and displayed in the patient rooms (Appendix I). Initially a note card was proposed to be included in each patient admission packet. However, each unit's admission packets are unique based on their service. No consensus on the process for adding and maintaining the notecards for the admission packets could be reached. Nursing reviewed oral care education at time of admission and was encouraged to reinforce it throughout the patient's hospitalization.

Besides patient education, nursing staff training will also be needed in order to help achieve nursing buy-in for the practice change. Rationale for oral care as a means to debride the oral cavity in order to reduce the risk for non-ventilated hospital acquired pneumonia as opposed to oral care being given to promote patient comfort should be stressed during training. Collaboration with the facility's Nursing Professional Development Specialists (NPDS) led to the identification of alternative methods for staff education. A nursing module for oral care was developed with all inpatient nursing staff as targeted recipients (Appendix J). Delivering the nursing education through a module allowed for recording of nursing staff members who received the education. While in-person meetings have been paused, each unit has a daily huddle between management and staff. Education about the newly implemented oral care protocol was provided during the daily huddles with an education acknowledgement form attached to the huddle talking points (Appendix K). The protocol is found on the facility's intranet site. An infographic about the oral care protocol was provided on the facility's nursing education and resource webpage (Appendix L).

Implementation of the protocol required approval from the facility's Shared Governance Standards and Practice Council (SPC). In order to make sure the protocol was ready to be presented to the SPC, it was initially presented to the facility's Shared Governance Research Council. The Research Council could provide recommendations for any edits and determine if the facility's IRB approval would be needed. Once approval of the oral care protocol was granted by SPC, a copy of the protocol was uploaded to the facility's policy and protocol folder, found on the intranet.

Evaluation was the last step in which the impact of the intervention was measured and areas for improvement were identified. This was accomplished through a rapid cycle improvement processes. Evaluation of the impact was planned to start 12 weeks post-implementation of the oral care protocol. However, due to a delay in the implementation, the amount of data collected was limited. Evaluation data post implementation was the same type of data gathered at baseline, documentation audits post-implementation as well as nursing staff and patient feedback. In order to sustain the practice change, surveillance will continue with monitoring both incidence of HAP as well as documentation of oral care provided. The continued surveillance can be done by a joint effort between oral care committee and the SPC.

Barriers to Implementation

Anticipated and unforeseen barriers were experienced during the implementation of this project. Cost was an anticipated barrier and identified during the first phase of implementation. Initially, a request for oral care kits for both dependent and independent non-ventilated patients was made however a significant increase in cost was found to be a barrier to this upgrade in supplies. A cost analysis comparing current products and requested oral care kits was presented to VAT. The return on investment from purchasing the oral care kits would have been based on

cost avoidance. After review of the product and its expected increase in expense in conjunction with current oral care practices, it was decided that a practice change was needed before a costly product change should occur. A solution was to evaluate more cost-effective products to provide recommended oral care.

The most significant barriers in the DNP project were related to the COVID-19 pandemic. Surges in COVID-19 related hospitalizations led to unprecedented census levels and limited staff resources. As a result, the timeline of this project was affected with delays in education, implementation, and evaluation. The planned timing of education coincided with a regional increase in patient hospitalizations for COVID-19. Both patient and nursing education were postponed until census and staffing levels returned closer to the facility's baseline. COVID-19 visitor restrictions limited many of the planned options for patient education, which included table tent cards and displays in patient/family lounges. It was initially planned for nursing education to occur prior to implementing the oral care protocol. However, it was believed nursing staff readiness for education during a peak census time would have hindered any of the education from being received. As a result, nursing staff education was held until census levels and resources stabilized. The proposed method of staff education was unit based and provided by the oral care subcommittee during staff meetings in order to have the most optimal outreach. However, COVID-19 related restrictions on gatherings discouraged this method of education.

A second unforeseen barrier was encountered when launching the patient education. Flyers were developed with initial plans to be placed in patient admission packets. It was discovered there was a lack of a centralized process for the content in the admission packets as the information is unit based. Feedback from frontline nursing staff raised concerns about the

additional time required for this patient education during the admission process as well as the patient's ability to receive the information.

IRB Approval

Facility approval for this project has been given by the facility's (CNO) (Appendix M). Faculty approval through Purdue University Global has been granted by Dr Marilyn McDonald, Faculty Mentor (Appendix N). IRB approvals for this project were obtained through Purdue University Global along with the selected facility (Appendices O & P). Training requirements to pursue research through Purdue University Global were completed through Collaborative Institutional Training Initiative (CITI) Program (Appendix Q).

Instruments for Data Collection

Evaluation instruments used included surveys and EHR reports. The surveys measured nursing knowledge and oral care prevalence. An initial Likert scale SurveyMonkey was sent to nursing staff on behalf of the Oral Care Subcommittee to obtain baseline information about nursing knowledge. A post-intervention SurveyMonkey regarding nursing knowledge of oral care was sent to nursing staff to complete. A prevalence survey was done as part of the needs assessment in which patient rooms were evaluated for presence of recommended oral care supplies including a toothbrush and mouth rinse. Further investigation was made to determine if the supplies in the room were being used. EHR reports evaluated nursing documentation and rates of NV-HAP through ICD-10 diagnosis codes. Evaluation of nursing documentation of oral care was further categorized to show whether oral cares were completed within the last 24 hours or if the patient refused cares. Lack of documentation showed no oral cares were provided, or the patient was not asked about oral care. Daily reports were collected before and following implementation of the oral care protocol. Reports of ICD-10 codes to include hospital acquired

pneumonia were gathered as part of the needs assessment data. Monthly reports of ICD-10 codes for hospital acquired pneumonia were collected for pre and postintervention data.

Data Analysis

Data was analyzed for this project through a pre and post implementation comparison. Collection of EHR reports measuring oral care documentation began 6 weeks prior protocol implementation and continued for the subsequent 11 weeks. A sample of 91 was collected. Documentation of oral care provided within the last 24 hours along with patient declining oral cares were measured. Lack of documentation meant no oral care was provided. Data gathered from the EHR reports showed an increased trend in oral care provided after the protocol was implemented (Appendix R). Prior to the protocol, approximately 45% of patients received oral care. Trending data after an oral care protocol was implemented showed approximately 55% of patients received oral care. Overall, trends in lack of oral care documentation showing no cares were provided decreased from approximately 41% to 17% after the protocol was implemented (Appendix S). While more patients received oral care after the protocol was implemented, there was an increase in patients declining oral care noted. There was an approximate 15% increase in the trending of patients who declined oral care post protocol implementation (Appendix T).

An oral care prevalence was conducted as an initial needs assessment and repeated 10 weeks after the protocol was implemented. The baseline sample size was 311 patients assess. Post implementation sample size was 148 patients. While pre-implementation, only 12% of patients had access to and were using recommended oral care supplies, post implementation survey results showed that amount of patients increased to 51% (Appendix U).

A SurveyMonkey was distributed on behalf of the Oral Care Subcommittee to gather baseline data regarding nursing knowledge of oral care as part of a needs assessment. Of the

approximate 400 staff nurses who received the survey, 107 responded. A repeat of this survey was planned immediately prior to protocol implementation however due to COVID-19 related delays in the project, this survey was distributed 9 weeks post protocol implementation and was compared to the Oral Care Subcommittee's data (Appendix V). The surveys were sent to staff nurses from the same departments as the needs assessment survey with 90 responses received. Based on comparison of results to survey questions, there was no significant change in nursing understanding of the impact of oral care on the patients' overall health. Nurses continue to report having the tools they need to provide adequate oral care. More nurses reported assisting dependent and non-ventilated patients with oral care after the protocol was implemented. Of note, prior to implementation, 6.73% of nurses reported never assisting those dependent patients with oral care. More nurses reported being aware of their independent patients' oral care habits during their hospitalization post protocol implementation. Post implementation, more nurses reported they always provide patient education regarding oral care.

Monthly reports of ICD-10 codes with a patient diagnosis of pneumonia present on admission were collected prior to and after the oral care protocol was implemented. A total of 33 patients developed NV-HAP in the 3 months prior to implementation. Monthly data was collected for February 2021, the implementation month and March 2021. Rates of NV-HAP dropped from 11 patients in February to 4 patients in March.

Project Evaluation

Formative Evaluation

In order to determine the efficacy of the intervention during the implementation, compliance with oral care was evaluated. Compliance was determined through auditing nursing documentation of oral care provided. An EHR report of oral care documentation was the tool used

for audits. While the overall trend of patients receiving oral care is increasing, one finding which has been noticed in these reports is the increased trend in patients declining oral care. This has shed light on a potential weakness of patient education from the implementation. Many of the patient education efforts were hindered due to a COVID-19 census surge in the facility.

Restriction of family and visitors decreased the expected value of developing any more oral care education within public places. A barrier related to a lack of processes or central ownership of the process was discovered when considering placing patient education flyers in the patient admission packets. In addition, there was concern about the added time needed to provide this education at the patient's admission along with consideration for the patient's ability to receive the information as they are being admitted to the hospital. Based on staff feedback, the solution to providing patient education was to laminate the flyers in order to meet infectious disease standards and post them in the patient rooms near the bathroom sink. This is a visible area to ambulatory patient however, bedbound patients will continue to need nursing education about the importance of oral care. Formative evaluation findings from collected data were shared with the unit managers. Managers were asked to reinforce to staff about the importance of patient education for oral care.

A repeat oral care prevalence survey, checking for oral care supplies and usage in patient rooms was completed to determine if patients had access and were using recommended oral care supplies. The same items were evaluated in both surveys. However, in order to conserve PPE, all isolation rooms were skipped in the post implementation survey, leading to a smaller sample size. Patients having access and using oral care supplies would be consistent with an increase in patients receiving oral care.

Summative Evaluation

The overall impact of the oral care protocol intervention was evaluated. An expected outcome after intervention would be a reduction in occurrence of hospital acquired pneumonia for non-ventilated patients. ICD-10 codes that included the diagnosis of pneumonia >48 hours after admission to the hospital without mechanical ventilation will be used for evaluation. Monthly rates were collected beginning 3 months prior to implementation and 2 months following. ICD-10 data was limited due to delay in the implementation as well as a 2 week time-lapse between a patient's discharge and the coding of their hospitalization diagnoses. This delay in coding led to the inability to collect April's data. The rates of those with NV-HAP after the intervention will be compared to pre-intervention rates. Even with limited data, a drop in patient cases of NV-HAP from 11 to 4 was observed from February to March after the protocol was implemented. In order to better appreciate this trend, more data will be needed.

As a more direct form of summative evaluation, a nursing knowledge survey regarding the importance of oral care will be sent to nursing staff toward the end of the evaluation phase. This survey was initially distributed to nursing staff in the early stages of this project when completing a needs assessment. The nursing knowledge survey was repeated post intervention with expectation of an increase in nursing knowledge regarding the importance of oral care would show a successful implementation of the oral care protocol. Limitations regarding this survey included a small sample size of 107 nurses completing the survey during the needs assessment and 90 nurses completing the survey post implementation.

Interpretation of Data and the Relationship of Data to the Problem Statement

Data showed an increase in documentation of nursing cares which shows an increased compliance with providing oral care to patients. There was also a decrease in lack of documentation, which would have indicated oral care was not addressed. An unexpected finding

was an increase in documentation of patients refusing oral cares. Even though documentation of patient refusals indicates patients were not receiving oral care, the documentation shows oral care was being addressed by nursing. Data showing the increased trend of patients refusing oral care was shared with leadership and nurse managers. While patient education was recommended as means to reduce the amount of patients refusing oral cares, the data could also show a need for more effective methods of patient education. SurveyMonkey data regarding nursing knowledge was sent to nursing 9 weeks after the oral care protocol was implemented. Nurses reported an increased amount of assistance in providing oral care to non-ventilated patients post implementation. In addition, post implementation survey results showed an increased nursing awareness of how often patients independent with cares were brushing their teeth while in the hospital. The post implementation survey also showed more nurses reported they always provide patient education when compared to the needs assessment survey. These survey results show an increased amount of nursing engagement in oral cares through providing assistance, education, and knowing the oral care habits of hospitalized patients independent with cares. The oral care prevalence survey of evaluating patient rooms for presence of recommended oral care supplies as well as evidence of patient usage was repeated 10 weeks post protocol implementation. Post implementation prevalence survey results showed more patient rooms had the recommended oral care supplies with patients using them. The findings from the prevalence survey showing the amount of patients possessing and using the recommended oral care supplies was consistent with the percentage of patients who nursing documented received oral care. As oral care was a modifiable factor in NV-HAP, reports containing ICD-10 codes consistent with hospital acquired pneumonia were collected immediately prior to and after the oral care protocol was implemented. While post protocol data was limited, NV-HAP rates dropped in the month

following the implementation. It would be reasonable to expect if patient oral care continues to increase, NV-HAP rates will decrease. The link between oral care and NV-HAP will be further strengthened if rates of NV-HAP continue to decrease as compliance in oral care increases.

Limitations

This project implementation took place at one hospital within the inpatient setting only. While patients at any age can develop NV-HAP, the age group for this project was limited to adults. The protocol may not be generalizable to all populations and adaptations may be required. Sample size of evaluation data was also limited as the implementation was delayed due to COVID-19 related circumstances. While oral care practice trends appeared to increase, additional ICD-10 data is needed to better appreciate if NV-HAP rates will continue to decrease. Limitations in recognition, research, and surveillance for NV-HAP show a need for more studies similar to this project to further validate the need for oral care protocols in a hospital setting. Multiple settings could be studied in future projects.

Implications of Project Findings; How Will the Project Data Change Practice?

Implications for practice was a change in culture. According to Rajan, Devi, Thomas, Mamatha, and Williams (2018), nurses understand the importance of good oral care but this knowledge is not reflected in their practice. This was evident as the nursing knowledge post implementation survey showed no change in nursing's understanding of the impact of oral care on the patient's overall health. Previous perceptions of oral care being a low priority task for patient comfort has changed. This is reflected by increased nursing documentation of oral cares provided, increased patient access and use of oral care supplies, more reported patient assistance and education, as well as knowledge of independent patient's oral care habits during hospitalization. Oral care has become a higher priority for nursing staff.

Project Sustainability

Changes in practice or process must be built on evidence-based practice research and understanding of human factors in order for any practice improvement to be sustainable (Bloch, Courtney, & Clark, 2016). Rapid cycle improvement processes provide an organization the means to continue to closely manage process improvement efforts after implementation of interventions. The Plan Do Study Act (PDSA) model was used in a rapid cycle improvement process and includes the following steps: collect and analyze data, planning the intervention; develop and test potential solutions; measure efficacy of solutions and analyze outcomes; modify the plan as needed and repeat the cycle (Zaccagnini, M.E. & White, 2017). A feature of this model is small adjustments which could be made and re-evaluated and if needed, further adjusted in a short period of time. The PDSA model is a process improvement tool used at SAH and was an appropriate option for the oral care protocol after implementation.

To promote long-term sustainability, standardized processes were developed and distributed to front-line staff in order to make the changes adhere (Hamm, 2016). A standardized process was developed and approved by the facility's Shared Governance Standards and Practice Council to serve as a guideline for practice within the hospital. The SPC audits all standardized processes and protocols after implementation to evaluate efficacy and outcomes. Having support from this council will be valuable in sustaining practice change. A nursing staff education module was developed to provide education regarding the oral care protocol. This module will be integrated into the new nursing orientation modules. Audits performed by the SPC and continued nursing staff education, along with being open to receiving feedback from staff and identifying any barriers to the process change will help mitigate the potential migration back to former practices.

Dissemination of Information

Executive Summary: Brief and Comprehensive Synopsis of the Project

Oral care is a modifiable risk factor for NV-HAP yet oral care provision at the selected facility was inconsistent due to inaccessible or unavailable oral care supplies, possible low priority with nursing staff, and lack of a standard oral care protocol. An oral care protocol was implemented within the hospital setting to reduce NV-HAP. The protocol included all inpatient adult units, excluding labor and delivery along with the centers for mental health units. Evaluation of the project was conducted through pre and post intervention comparison of ICD-10 codes, nursing documentation of oral care, oral care prevalence survey, and nursing knowledge survey. Post implementation evaluation data showed an increase in oral care practice based on nursing documentation, availability and use of oral care supplies. Improved understanding of providing oral care to prevent HAP, made oral care a higher priority for nursing staff. While data was limited, a decrease in NV-HAP was noted the month following the oral care protocol implementation.

Written Dissemination

A final project paper has been written to disseminate what was learned from this project. The entire process has been discussed along with key findings and outcomes. This final project paper will be submitted in fulfillment for the Doctorate of Nursing Practice requirements from Purdue University Global.

Oral Presentation to Key Stakeholders

Findings from this project along with the implementation will also be orally presented to stakeholders at the facility along with faculty and other DNP candidates at Purdue University Global. The project site holds monthly Excellence in Nursing meetings in which research

conducted by nursing is disseminated. Presenting at an Excellence in Nursing meeting will highlight the nursing practice change, which is at the core of this project. A final presentation of the DNP student's project will be given virtually at Purdue University Global. Media used to aid in the presentation will be a PowerPoint presentation.

Future Scholarship

Sharing innovation with other groups of nurses and health care professionals leads to improved population health outcomes at a broader reach. Submitting a manuscript to a peer-reviewed journal will allow for the information learned from this project to reach a larger audience. A journal which was identified for manuscript submission is the Journal of Advanced Nursing. The Journal of Advanced Nursing is an international peer-reviewed journal which aims to contribute to the advancement of evidence-based nursing by disseminating research to advance knowledge for practice.

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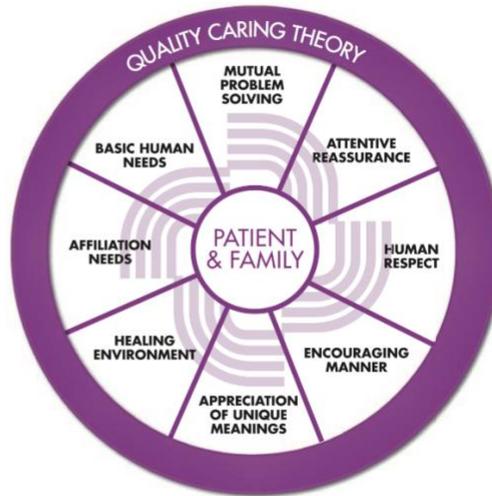
Appendix A

Swedish American Hospital Nursing Model Based on Joanne Duffy's Quality Caring Model.

Quality Caring Model

Our nurses aspire to emulate Joanne Duffy's Quality Caring Model (QCM), which addresses and encompasses the following caring relationships:

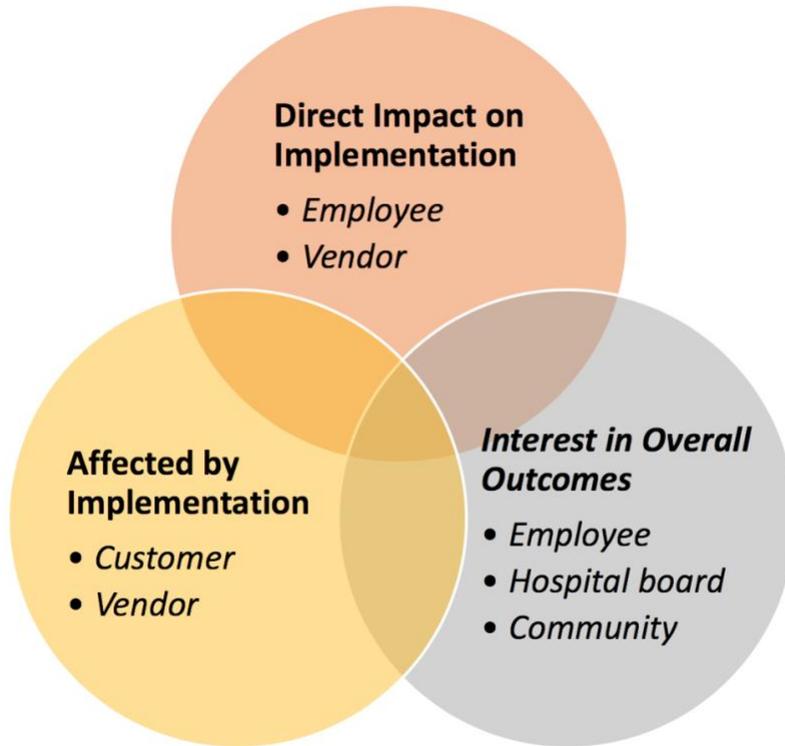
- Self
- Patient & Families
- Each Other
- Communities



Note. Swedish American Hospital Nursing Model Based on Joanne Duffy's Quality Caring Model.

Appendix B

Identified key stakeholders with hospital oral care protocol implementation.



Note. Identified key stakeholders with hospital oral care protocol implementation.

Appendix C

Oral Care Subcommittee Needs Assessment Survey

Oral Care Subcommittee Survey

1. Oral care impacts a hospitalized patient’s overall health				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. I have the tools I need to provide adequate oral care to my patients				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3. On average, how often do you provide oral care for a non-ventilated patient who requires assistance?				
Never	I don’t know	At least 1x/day	At least 2x/day	At least 3x/day

4. How often do your independent patients brush their teeth while in the hospital				
Never	I don’t know	At least 1x/day	At least 2x/day	At least 3x/day

1. I educate my patients and their families about the importance of oral care during their hospital stay		
Never	Sometimes	Always

Note. Oral Care Subcommittee Needs Assessment Survey

Appendix D

Evidence Pyramid



(Purdue University Global Library: Doctor of Nursing Practice Guide, 2019)

Note. Evidence Pyramid

Appendix E

Levels of Evidence and Grades of Recommendations

Levels and Grades of Evidence

Levels of Evidence and Grades of Recommendations

Grade of recommendation	Level of evidence	Interventions
A	1a	Systematic review of randomized controlled trials
	1b	Individual randomized controlled trial
B	2a	Systematic review of cohort studies
	2b	Individual cohort study
	3a	Systematic review of case-control studies
	3b	Individual case-control study
C	4	Case series
D	5	Expert opinion without explicit critical appraisal or based on physiology or bench research

Note. Levels of Evidence and Grades of Recommendations

Appendix F**Levels of evidence for literature synthesis**

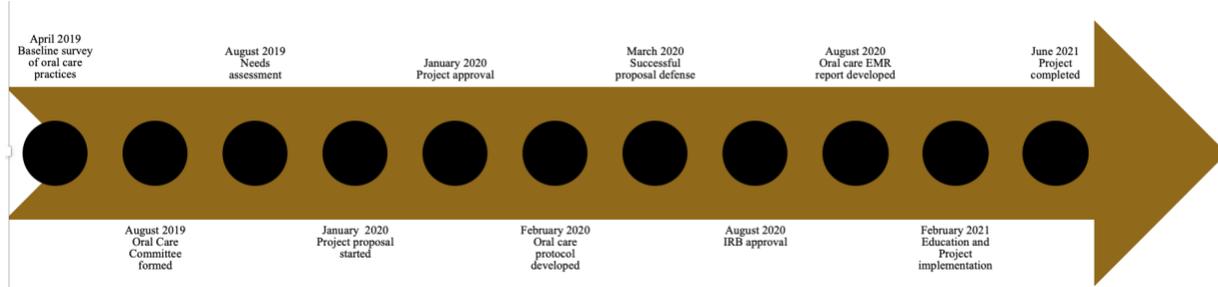
Review of Literature

Level 1 = 0
Level 2 = 5
Level 3 = 2
Level 4 = 2
Level 5 = 1
Level 6 = 0

Note. Levels of evidence for literature synthesis

Appendix G

Project Timeline



Note. Project Timeline

Appendix H

Oral Care Protocol Standard Work

STETSON/AMERICAN A DIVISION OF OH HEALTH			
Standard Work			
Timing: Oral Care Protocol For Non-Ventilated Patients		Process Owner: Jessica Simmons	Last Updated: 01/25/2021
Performed by: Nursing units			
Purpose: The oral care protocol will provide a standard of oral care for all adult in-patient units based on dependency with cares and if there is known dysphagia.			
Standard Work Summary: A standardized oral care protocol helps reduce risk of hospital acquired infection associated with non-ventilator hospital acquired pneumonia.			

Patient Assessment	Supplies Needed	Procedure	Frequency
<ul style="list-style-type: none"> Independent with cares No known dysphagia Able to swallow Able to expectorate 	<ul style="list-style-type: none"> Soft bristle toothbrush Therapeutic toothpaste Antiseptic mouth rinse Non-petroleum mouth moisturizer Denture cup (as needed) Denture cleaner (as needed) 	<ul style="list-style-type: none"> Brush teeth for 2 minutes spending 30 seconds in each quadrant of the mouth and tongue Swish and spit antiseptic mouth rinse Moisturize lips Label oral care supplies with patient name and store in clean dry location Dentures: Gently brush palate, cheeks, gums, and tongue for 2 minutes spending 30 seconds in each quadrant of the mouth Carefully brush dentures with warm water. Avoid toothpaste, which can scratch dentures. After bedtime care, soak dentures in denture cleaner 	Encourage patient oral care: <ul style="list-style-type: none"> After each meal At bedtime 4 times/day if NPO

<ul style="list-style-type: none"> Dependent with cares No known dysphagia Able to swallow Able to expectorate 	<ul style="list-style-type: none"> Soft bristle toothbrush Therapeutic toothpaste Antiseptic mouth rinse Non-petroleum mouth moisturizer Denture cup (as needed) Denture cleaner (as needed) 	<ul style="list-style-type: none"> Brush teeth for 2 minutes spending 30 seconds in each quadrant of the mouth and tongue Swish and spit antiseptic mouth rinse Moisturize lips Label oral care supplies with patient name and store in clean dry location Dentures: Gently brush palate, cheeks, gums, and tongue for 2 minutes spending 30 seconds in each quadrant of the mouth Carefully brush dentures with warm water. Avoid toothpaste, which can scratch dentures. After bedtime care, soak dentures in denture cleaner 	Provide patient oral care: <ul style="list-style-type: none"> After each meal At bedtime 4 times/day if NPO
<ul style="list-style-type: none"> Known dysphagia Unable to expectorate Unable to follow commands 	<ul style="list-style-type: none"> Suction oral brush kit, Yankapops, tubing, and canister Therapeutic toothpaste Oral care swabs Antiseptic mouth rinse Non-petroleum mouth moisturizer Denture cup (as needed) Denture cleaner (as needed) 	<ul style="list-style-type: none"> Sit patient upright or in side-lying position Inspect mouth and use Yankapops suction to remove any excess saliva or loose debris Connect oral brush to suction Brush teeth for 2 minutes spending 30 seconds in each quadrant of the mouth and tongue Use suction brush to suction toothpaste, saliva, and debris Dip swab into mouth rinse and swab along teeth, gums, cheeks, palate, and tongue Suction to remove excess rinse Moisturize lips Label oral care supplies with patient name and store in clean dry location Dentures: Gently brush palate, cheeks, gums, and tongue for 2 minutes spending 	Provide patient oral care: <ul style="list-style-type: none"> After each meal At bedtime 4 times/day if NPO

		<ul style="list-style-type: none"> 30 seconds in each quadrant of the mouth; use suction to remove excess toothpaste and saliva Carefully brush dentures with warm water. Avoid toothpaste, which can scratch dentures. After bedtime care, soak dentures in denture cleaner 	
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Note. Oral Care Protocol Standard Work

Appendix I

Patient education flyer

**BRUSH YOUR TEETH
TO PREVENT PNEUMONIA**

Regular tooth brushing lowers the number of germs in your mouth and the risk of pneumonia.



The germs in your mouth have a direct pathway to your lungs and can cause pneumonia



Brushing your teeth lowers your chance of developing hospital acquired pneumonia by 30%



Brush your teeth after each meal and before bedtime to help your recovery and to avoid pneumonia

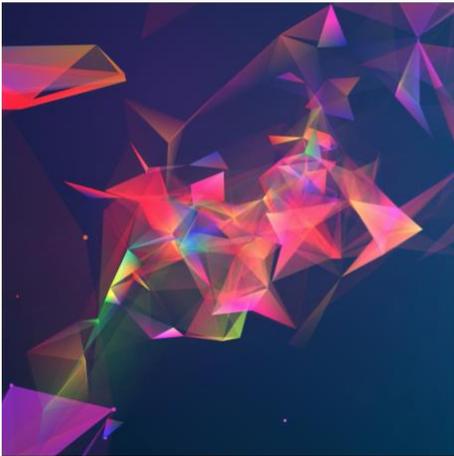


BRUSH YOUR TEETH FOR YOUR HEALTH.

Note. Patient education flyer

Appendix J

Nursing Module



Oral Care Protocol

To Reduce Non-Ventilator Hospital
Acquired Pneumonia

Note. Nursing Module

Appendix K

Huddle Talking Points

BRUSH YOUR TEETH TO PREVENT PNEUMONIA

Regular tooth brushing lowers the number of germs in your mouth and the risk of pneumonia.



The germs in your mouth have a direct pathway to your lungs and can cause pneumonia



Brushing your teeth lowers your chance of developing hospital acquired pneumonia by 30%



Brush your teeth after each meal and before bedtime to help your recovery and to avoid pneumonia



BRUSH YOUR TEETH FOR YOUR HEALTH.

Document oral care provided by nursing or any patient self-cares:

- Document all oral hygiene cares in nursing flowsheet under "Daily Care"

<ul style="list-style-type: none"> Independent with cares No known dysphagia Able to swallow Able to expectorate 	<ul style="list-style-type: none"> Soft bristle toothbrush Therapeutic toothpaste Antiseptic mouth rinse Non-petroleum mouth moisturizer Denture cup (as needed) Denture cleaner (as needed) 	<ul style="list-style-type: none"> Brush teeth for 2 minutes spending 30 seconds in each quadrant of the mouth and tongue Swish and spit antiseptic mouth rinse Moisturize lips Label oral care supplies with patient name and store in clean dry location Dentures: Gently brush palate, cheeks, gums, and tongue for 2 minutes spending 30 seconds in each quadrant of the mouth Carefully brush dentures with warm water. Avoid toothpaste, which can scratch dentures. After bedtime care, soak dentures in denture cleaner 	<ul style="list-style-type: none"> Encourage patient oral care: After each meal At bedtime 4 times/day if NPO
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Huddle Guide

Clinical Thinking Questions	Learner Response
1. How often should oral care be provided each day?	
2. What are the supplies needed to provide oral care?	
3. How do you store the patient's oral care supplies?	
4. What special oral care needs to patients with dentures have?	
5. How do you document oral care provided?	

Note. Huddle Talking Points

Appendix L

Oral Care Infographic

WHY IS ORAL CARE SO IMPORTANT FOR OUR HOSPITALIZED PATIENTS?

PATIENTS ARE AT RISK FOR HOSPITAL ACQUIRED PNEUMONIA

-  There are over 700 different species of bacteria pathogens found in the mouth
-  Hospitalized patients experience disruptions in their diet, oral care, and overall health
-  Gram negative bacteria replicates rapidly and will triple every 3-6 hours
-  Bacteria has a direct pathway from the mouth to the lungs which can lead to pneumonia

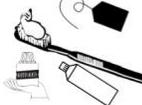
 Hospital acquired pneumonia (HAP) accounts for over 21% of all hospital acquired infections. *Of those, 60.9% of HAP is Non-ventilator Hospital Acquired Pneumonia (NV-HAP).* Yet we still have little recognition, research, and surveillance

 Average cost of NV-HAP \$39,897

 According to 2018-2019 data, SAH had 48 cases of NV-HAP with an estimated cost of \$1,920,000

PROVIDE OR ENCOURAGE PATIENT ORAL CARE AFTER EACH MEAL AND BEFORE BEDTIME....OR 4 X/DAY

-  Assess your patient's ability to complete oral care independently and provide needed supplies
-  If your patient is unable to expectorate or swallow, use suction toothbrush and **vacuums**
-  Patients with dentures should brush their palate, inner cheeks, gums, and tongues
-  Refer to the Oral Care Standard Work on the HUB for complete protocol

 Label oral care supplies with patient's name. Store supplies in a clean dry location.

BE SURE TO DOCUMENT WHEN ORAL CARE IS COMPLETED

Note. Oral Care Infographic

Appendix M

SwedishAmerican Hospital Project Approval

SWEDISHAMERICAN
A DIVISION OF UW HEALTH



Administration Office
1401 East State Street
Rockford, IL 61104
779.696.4002
779.696.2463 Fax

February 21, 2020

Dr. Elizabeth Copeland,

I am writing to share my support for Jessica Simmons' project; "Implementing an Oral Care Protocol in a Hospital Setting to Reduce Non-Ventilator Hospital Acquired Pneumonia".

SwedishAmerican Hospital is excited to be a part of this project.

Sincerely,

Ann Gantzer, PhD, RN, NEA-BC
VP of Nursing and CNO
SwedishAmerican Health System
Administration
1401 E. State St.
Rockford, IL 61104

Note. SwedishAmerican Hospital Project Approval

Appendix N
Faculty Proposal Approval



DNP Project Proposal Defense Evaluation

Name of Student: Jessica Simmons

Date: 3/15/2020

DNP Project Title: Implementing of an Oral Care Protocol in a Hospital Setting to Reduce Non-Ventilator Hospital Acquired Pneumonia

Evaluation: Approved [x] Approved with recommendations Not approved

Comments:

DNP Student:

Signature line for Jessica Simmons, Date 3/8/2020

DNP Faculty Mentor:

Signature line for Marilyn McDonald, Date 3/5/2020, electronically signed

Note. Faculty Proposal Approval

Appendix O**Purdue University Global IRB Approval**

Institutional Review Board
550 West Van Buren
Chicago, Illinois 60607

Expedited Review – Final Approval

August 21, 2020

Ms. Jessica Simmons
Purdue University Global
jessicasimmons44@student.purdueglobal.edu

Re: Protocol #20-42 **Implementing an Oral Care Protocol in a Hospital Setting to Reduce Non-Ventilator Hospital Acquired Pneumonia**

Dear Ms. Simmons:

Your proposed project was reviewed by the Purdue University Global Institutional Review Board (IRB) for the protection of human subjects under an Expedited Category. It was determined that your project activity meets the expedited criteria as defined by the DHHS Regulations for the Protection of Human Subjects (45 CFR 46), and is in compliance with this institution's Federal Wide Assurance 00010056.

Please notify the IRB immediately of any proposed changes that may affect the expedited status of your project. You should report any unanticipated problems involving risks to human subjects or others to the IRB.

If you have any questions or need additional information, please contact feel free to contact me at spettine@purdueglobal.edu. I wish you well with your project!

Sincerely,

Susan B. Pettine

Susan B. Pettine, Ph.D., CBM
IRB Chair
Purdue University Global

cc: Dr. Marilyn McDonald
Dr. Amy Daly

Note. Purdue University Global IRB Approval

Appendix P
Facility IRB Approval

SWEDISHAMERICAN
A DIVISION OF UW HEALTH

January 28, 2021

Jessica Simmons, MSN, APRN, FNP-C, CWON, DNC, BSN, CEN, TNS
1415 East State Street
Rockford, IL 61104

RE: APPROVAL OF PROPOSAL: Implementing an Oral Care Protocol in a Hospital Setting to Reduce Non Ventilator Hospital Acquired Pneumonia

Dear Jessica:

Please be advised that at its meeting on this date, the SwedishAmerican Hospital Institutional Review Board approved your request for research "Implementing an Oral Care Protocol in a Hospital Setting to Reduce Non Ventilator Hospital Acquired Pneumonia". Also approved was waiver of informed consent.

You are reminded that any changes in research activity or changes in approved research may not be initiated without Institutional Review Board approval.

This signature certifies that the information contained in this IRB notice is true and correct as verified by the minutes and records of the SAH IRB. It also certifies that the SAH IRB is in full compliance with the FDA Code of Federal Regulations, GCP Guidelines and ICH Guidelines.

Thank you for submitting this well written, interesting protocol. If you have any questions, please feel free to contact me.

Sincerely,



Anna Frank, Research Coordinator
SwedishAmerican Hospital

Note. Facility IRB Approval

Appendix Q

CITI Training

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on the Requirements Report reflect quiz completion at the time all requirements for the course were met. See list below for details. See separate Requirements Report for more quiz scores, including those on optional supplemental course elements.

Name: Jessica Simmons (ID: 0402085)
Institution Affiliation: Purdue University Global (ID: 487)
Institution Email: jessicasimmons@student.purdueglobal.edu
Institution Unit: Nursing
Phone: #15225250

Course Group: Human Research
Course Learner Group: Group 2 SOCIAL
Stage: Stage 1 - Basic Course
Description: This course is suitable for investigators and staff conducting SOCIAL / HUMANISTIC / BEHAVIORAL RESEARCH with human subjects.

Report ID: 3332047
Completion Date: 14-Sep-2019
Expiration Date: 13-Sep-2021
Minimum Passing: 80
Report Status: 80

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Belmont Report and Its Provisions (ID: 1127)	14-Sep-2019	93 (100%)
Students in Research (ID: 1121)	14-Sep-2019	45 (90%)
History and Ethical Principles (ID: 482)	14-Sep-2019	85 (100%)
Conflicting Research with Human Subjects (ID: 481)	14-Sep-2019	45 (90%)
The Federal Regulations (ID: 882)	14-Sep-2019	85 (100%)
Assessing Risk (ID: 802)	14-Sep-2019	45 (90%)
Informed Consent (ID: 504)	14-Sep-2019	45 (90%)
Privacy and Confidentiality (ID: 805)	14-Sep-2019	45 (90%)
Research with Prisoners (ID: 505)	14-Sep-2019	85 (100%)
Research with Children (ID: 803)	14-Sep-2019	85 (100%)
Research in Public Elementary and Secondary Schools (ID: 808)	14-Sep-2019	45 (90%)
International Research (ID: 806)	14-Sep-2019	45 (90%)
Human Subject Research (ID: 510)	14-Sep-2019	85 (100%)
Research and HIPAA Privacy Protections (ID: 14)	14-Sep-2019	85 (100%)
Conflicts of Interest in Human Subjects Research (ID: 17484)	14-Sep-2019	85 (100%)
Caplan University (ID: 793)	14-Sep-2019	Not Due

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subuniting Institution identified above or have been a past Independent Learner.
 Verify at: www.citiprogram.org/en/343517315-6af-640-691-afabaweb/04-3332047

Collaborative Institutional Training Initiative (CITI Program)
 Email: support@citiprogram.org
 Phone: 800-432-0329
 Web: www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRAINING ONLY*

* NOTE: Scores on this Training Report reflect the most current quiz completion, including quizzes on optional supplemental elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

Name: Jessica Simmons (ID: 0402085)
Institution Affiliation: Purdue University Global (ID: 487)
Institution Email: jessicasimmons@student.purdueglobal.edu
Institution Unit: Nursing
Phone: #15225250

Course Group: Human Research
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Stage: Stage 1 - Basic Course
Description: This course is suitable for investigators and staff conducting SOCIAL / HUMANISTIC / BEHAVIORAL RESEARCH with human subjects.

Report ID: 3332047
Report Date: 14-Sep-2019
Current Score: 80

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Students in Research (ID: 1121)	14-Sep-2019	45 (90%)
Conflicting Research with Human Subjects (ID: 481)	14-Sep-2019	45 (90%)
The Federal Regulations (ID: 882)	14-Sep-2019	85 (100%)
Belmont Report and Its Provisions (ID: 1127)	14-Sep-2019	93 (100%)
Assessing Risk (ID: 802)	14-Sep-2019	45 (90%)
Informed Consent (ID: 504)	14-Sep-2019	45 (90%)
Privacy and Confidentiality (ID: 805)	14-Sep-2019	45 (90%)
Research with Prisoners (ID: 505)	14-Sep-2019	85 (100%)
Research with Children (ID: 803)	14-Sep-2019	85 (100%)
Research in Public Elementary and Secondary Schools (ID: 808)	14-Sep-2019	45 (90%)
International Research (ID: 806)	14-Sep-2019	45 (90%)
Research and HIPAA Privacy Protections (ID: 14)	14-Sep-2019	85 (100%)
Human Subject Research (ID: 510)	14-Sep-2019	85 (100%)
History and Ethical Principles (ID: 482)	14-Sep-2019	85 (100%)
Caplan University (ID: 793)	14-Sep-2019	Not Due
Conflicts of Interest in Human Subjects Research (ID: 17484)	14-Sep-2019	85 (100%)

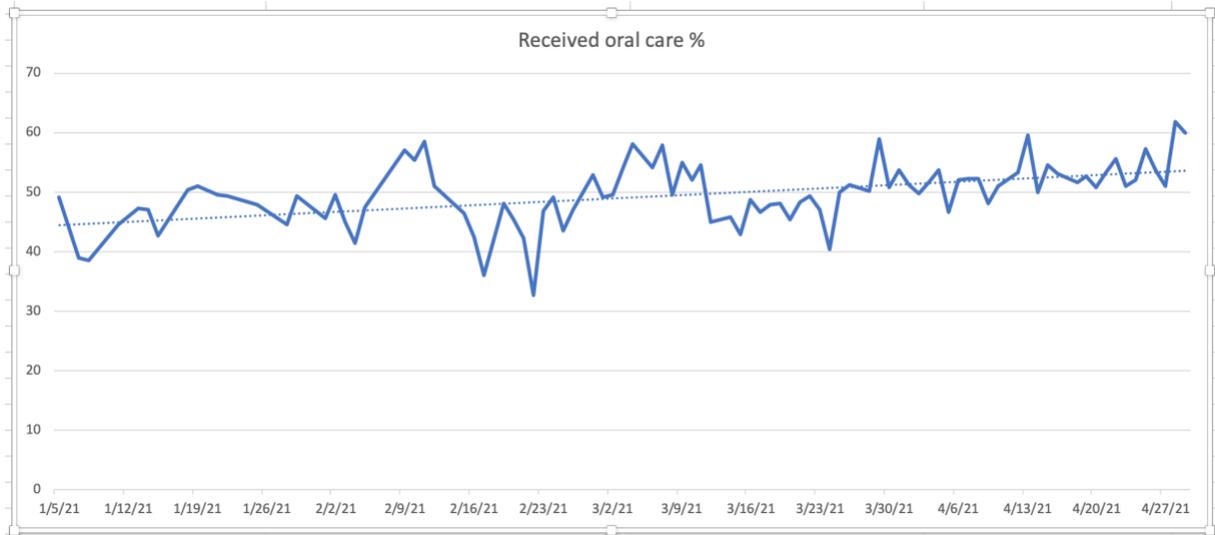
For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subuniting Institution identified above or have been a past Independent Learner.
 Verify at: www.citiprogram.org/en/343517315-6af-640-691-afabaweb/04-3332047

Collaborative Institutional Training Initiative (CITI Program)
 Email: support@citiprogram.org
 Phone: 800-432-0329
 Web: www.citiprogram.org

Note. CITI Training

Appendix R

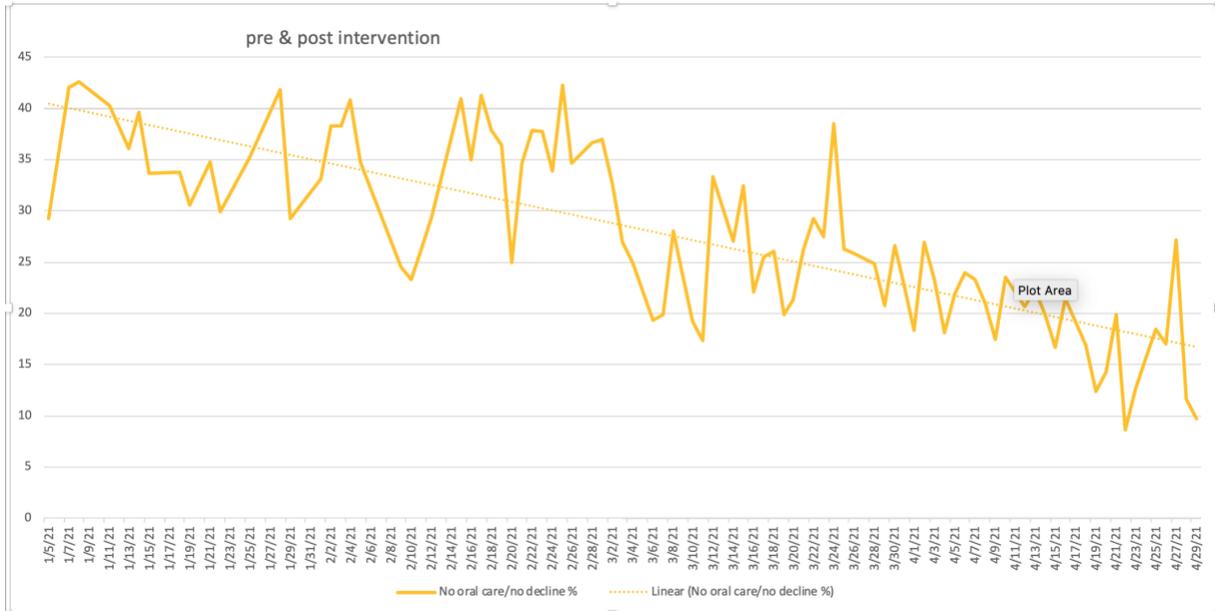
Patients receiving oral care based on EHR reports



Note. Patients receiving oral care based on EHR reports

Appendix S

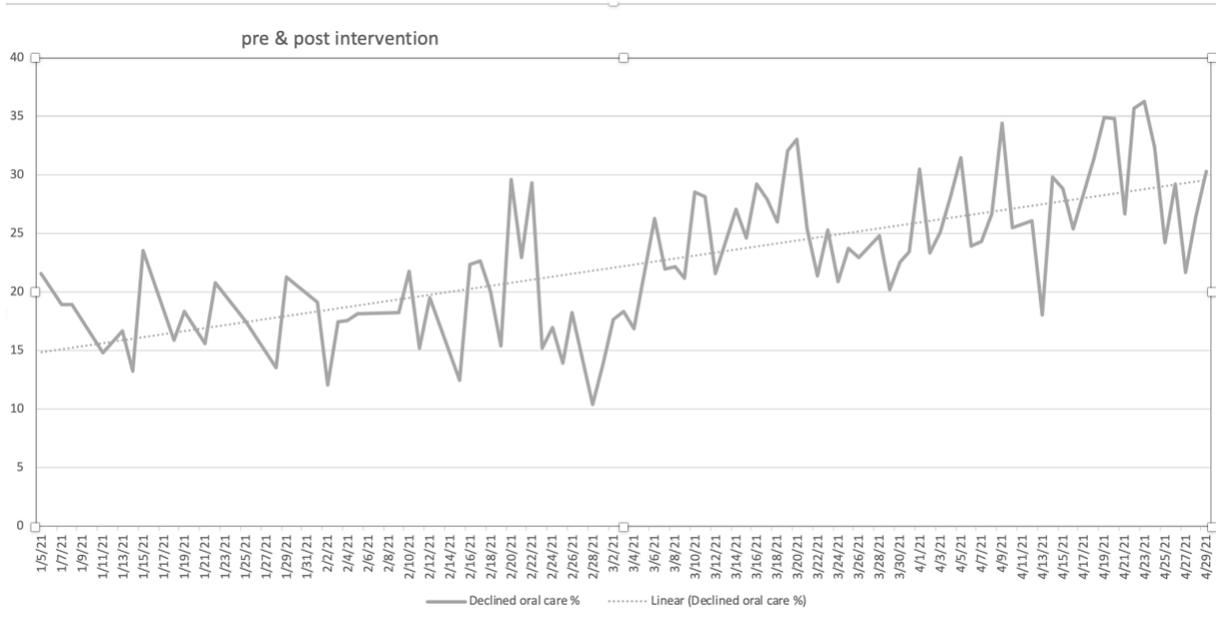
Patients who received no oral care based on EHR reports



Note. Patients who received no oral care based on EHR reports

Appendix T

Patients who declined oral care based on EHR reports



Note. Patients who declined oral care based on EHR reports