Oral Care Prior to Elective Surgery

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This is to certify that I have examined this Doctor of Nursing Practice DNP project manuscript written by

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and have found that it is complete and satisfactory in all respects, and that any and all revisions required by the final examining committee have been made.

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Abstract

**Objective:** This study aimed to understand baseline oral care completion rates before elective cardiovascular surgery (CVS). There are germs in the oral cavity (Li et al., 2000) that reproduce frequently (Quinn & Baker, 2015). Intubation through an unclean mouth can translocate germs to the lungs (Davis & Finley, 2012). Oral care, specifically brushing teeth, may reduce hospital-acquired pneumonia (HAP). Oral care completion before elective surgery is likely variable but remains unknown.

**Methods:** Surveys were administered to the patients in the preintervention and intervention groups. Patients in the intervention group were provided information on oral care, dental supplies, and an intentional conversation with the registered nurse about the importance of oral care.

**Results:** The intervention group did show an 11% increase in the number of patients reporting oral care completion before elective CVS.

**Conclusions:** The intervention of providing oral care information, dental supplies, and the intentional conversation did motivate patients to complete oral care before elective surgery. The simple and cost-effective intervention of patients brushing their teeth before elective surgery could reduce the number of microbes in their oral cavity and lessen the risk of HAP (Chughai et al., 2017).
Oral Care Prior to Elective Surgery

The importance of oral care before surgery is not well known as the concept is emerging. Oral care is the cleaning of the mouth, including brushing the teeth and the tongue. Cleaning the oral cavity reduces the bacteria and biofilm that can build on oral surfaces. Hospital-acquired pneumonia (HAP) is pneumonia that is diagnosed after 48 hours of hospitalization (Niederman, 2010). Patients completing oral care before elective surgery is likely variable but remains unknown. The completion of oral care before elective surgery is important in reducing postoperative HAP. The reduction of HAP improves patient outcomes as postoperative HAP is common (Chughai et al., 2017; Spreadborough et al., 2016; Thompson et al., 2006). Registered nurses aim to provide safe and effective care, including taking measures to prevent infections. The literature has identified a knowledge gap with health care providers understanding the importance of oral care and the connection to postoperative HAP (Quinn & Baker, 2015), which is considered a hospital-acquired infection (HAI). Patients receive education on prepping their skin before surgery to prevent surgical site infections; similarly, knowledge about oral care to patients and providers may be just as essential in decreasing HAP incidence.

Background and Significance

It is unknown if patients who report for elective surgery have completed oral care. Further, patients receive no information or direction to perform oral care before elective surgery. This unknown can pose a risk to patients who have not completed oral care. The evidence shows that there are billions of microbes in our saliva (Li et al., 2000). Germs present in the mouth can reproduce every four to six hours (Quinn & Baker, 2015). Intubation through an unclean oral cavity can lead to germs migrating to the lungs causing HAP (Davis & Finley, 2012). This risk highlights that brushing teeth is important; this is true even if the patient is not eating or drinking.
When patients follow nothing by mouth (NPO) guidelines, they might assume that this includes brushing their teeth.

Patients undergoing surgery may not be able to fight infections due to the stress response induced by surgery (Chughai et al., 2017; Davis & Finley, 2012). Factors that contribute to HAP include oral and oropharynx secretions that are aspirated while patients are mechanically ventilated, which can lead to HAP (Akutsu et al., 2009, Bardia et al., 2019, Bergan et al., 2014, Caparelli et al., 2019, Hiramatsu et al., 2014, Houston et al., 2002, Martin-Loeches & Torres, 2014, Semenkovich et al., 2019, Spreadborough et al., 2016). Another risk factor is that oral biofilm can break off during intubation and translocate to the lungs and cause HAP (Bergan et al., 2014). While it is unrealistic to eliminate all the risk factors that can contribute to HAP, there is one that nursing may be able to influence. The simple and cost-effective intervention of patients brushing their teeth before elective surgery could reduce the number of microbes in their oral cavity and lessen the risk of HAP (Chughai et al., 2017).

In addition to patient risk factors, health care providers may contribute to HAP unknowingly. There is a knowledge gap for healthcare providers on the connection between the oral cavity's cleanliness and the risk of HAP (Quinn & Baker, 2015). Providers need education on the evidence of the relationship between oral care and the reduction of HAP. When there is an understanding of the evidence of oral care and the potential for HAP outcome, this can assist in creating buy-in for providers. This understanding will motivate providers, including nursing staff, to have intentional conversations with their patients about the importance of oral care before elective surgery during the patient’s preoperative visit. This conversation with the patient may be one additional step to safeguard their patients from infections.
If patients acquire HAP, there are many negative consequences. Significant outcomes of HAP include increased length of hospital stay and substantial costs (Baker & Quinn, 2018; Chughai et al., 2017; Spreadborough et al., 2016; Thompson et al., 2006). HAP is also known to contribute to morbidity and mortality (Baker & Quinn, 2018; Chughai et al., 2017; Spreadborough et al., 2016; Thompson et al., 2006). An additional consequence of HAP is that patients may be weaker and have disposition needs despite previous independence at home. Disposition needs may result in a higher level of care after hospitalization for rehabilitation at a skilled nursing facility, thus impacting the patient’s quality of life (Baker & Quinn, 2018; Thompson et al., 2006).

Elective surgery patients should receive information and education on the importance of prepping or cleaning their oral cavity before surgery to reduce the risk of postoperative HAP as pneumonia is a risk factor with surgery (Thompson et al., 2006). Providing information to patients, such as printed materials on the significance of oral care completion before elective surgery, may help patients better to understand the oral care benefits or the risks if omitted. Having oral care reminders incorporated into multiple items such as patient education materials, patient appointment guides (PAGs), and NPO guidelines would also increase the awareness regarding the importance of oral care. Seeing oral care messages in multiple printed materials and nurses having intentional conversations with their patients may positively influence the patients' behavior toward oral care completion.

Needs Assessment

As an advanced practice nurse on an inpatient oral care workgroup to prevent nonventilated hospital-acquired pneumonia, it became evident that there were no practice standards around oral care before elective surgery. A part of the identified practice gap includes the lack of practice
standards directing patients to brush their teeth before elective surgery or to ensure that oral care is completed. The identified practice gap of oral care before elective surgery became a new focus.

A large medical teaching institution in the Midwest has a high volume of surgical patients and could potentially benefit from including oral care education in their practice. There are no practice standards directing patients to complete oral care before elective surgery or mechanism to ensure that oral care is completed. Oral care before elective surgery in the home setting is unknown and likely inconsistent; however, the literature states that postoperative HAP is common (Chughai et al., 2017; Spreadborough et al., 2016; Thompson et al., 2006). HAP does occur in the postoperative setting, but to what degree is not well known. One incidence of HAP is costly to the patient, the institution, the healthcare system, and the overall utilization of healthcare access and dollars. This teaching institution is open to quality improvement (QI) projects and research activities. The Doctor of Nursing Practice (DNP) student shared this QI project concept with several key stakeholders and committees. The DNP student gained endorsement to implement the oral care project in cardiovascular surgery (CVS) with adult elective CVS patients.

**Significance and Contribution to the Literature**

The existing literature does not specify an intervention outside of education to motivate a patient’s behavior towards oral care completion. The literature states that postoperative HAP is common (Chughai et al., 2017; Spreadborough et al., 2016; Thompson et al., 2006). HAP does occur in the postoperative setting, but to what degree is not well known. Without the preoperative baseline oral care completion rates, it is difficult to determine the level of opportunity for HAP reduction with targeted intervention. Data on ventilator-associated
pneumonia is readily available and is reported externally, whereas HAP data is not reported externally and is challenging to track. It is difficult to obtain data due to the perceived lack of correlation between preoperative oral care completion and HAP with health care providers (Quinn & Baker, 2015).

Additionally, when nursing lacks an understanding of the relationship between oral care and the risk if not completed, nursing will not be prompted to discuss oral care completion as a means to reduce HAP risk with their patients. Further, there are many competing priorities in the healthcare environment. Oral care before elective surgery QI project aims to identify baseline oral care completion data. Before the project intervention, surveying patients before elective CVS will determine the number of patients who brush their teeth within four to six hours before their elective surgery. This data will identify if providing the intervention of information and dental supplies, including a toothbrush and toothpaste, helps with individual patient behavior change. It is thought that this intervention will motivate patients and increase the number of patients who report that they brushed their teeth within four to six hours before elective surgery during the intervention phase. The literature presents a gap between baseline oral care completion rates and an intervention to motivate a behavior change towards oral care completion. Oral care, specifically brushing the teeth, is a low-cost intervention and a starting point for reducing HAP risk. To address one aspect of HAP prevention, data on current oral care before surgery is necessary.

**Significance to Nursing Profession**

The lack of oral care standards before elective surgery was a nurse identified practice gap and opportunity. The nursing staff takes measures to safeguard patients and prevent infections. Further, HAIs are considered a nursing-sensitive indicator. Priority is not placed on oral care
completion with the current lack of understanding between oral care and the potential for postoperative HAP. When nurses understand the importance of oral care before elective surgery and how that correlates to risk reduction with postoperative HAP, they will be more apt to take measures to explain this with their patients. One opportunity is to incorporate the informational flyer as a standard of care for all elective surgery patients. Another opportunity is to bundle the chlorhexidine bath information and supplies with the oral care information and supplies. In turn, when patients hear about oral care and how it can reduce the risk of postoperative infections during these discussions, it can positively motivate the patient's behavior and aid in completing oral care. When patients are brushing their teeth within four to six hours before elective surgery, the risk of postoperative HAP is reduced to some degree. Decreasing the risk for HAP will benefit the institution’s utilization indicators, specifically patient flow indicators, by decreasing the length of stay (Penner, 2017).

**Purpose Statement**

Oral care in the preoperative setting is variable and likely does not occur. Brushing teeth is important even if the patient is not eating or drinking. When patients follow the nothing by mouth (NPO) guidelines, patients might assume that this means that they should not brush their teeth, and therefore, they may have an increased risk of HAP after surgery. This project aimed to understand baseline oral care completion rates for patients before elective CVS.

**PICOT Question**

In elective CVS patients, does oral care instructions and providing supplies influence patient report of completing oral care before arrival to the hospital the morning of surgery?

**Project Purpose**
Oral care in the preoperative setting is one element that is important to reduce postoperative HAP and improve patient safety. Postoperative pneumonia is a risk factor with surgery (Thompson et al., 2006). This DNP QI project's intended purpose is to inform providers and patients of the importance of oral care completion before elective surgery and motivate the patient’s behavior towards oral care completion before elective CVS to reduce the postoperative risk of pneumonia.

**Project Goals**

This QI project has two primary goals. One goal is to measure baseline oral care data prior to elective surgery. The other goal is to evaluate the effectiveness of intervention provided through intentional conversation, information, and dental supplies.

- Measure the number of adult CVS patients completing oral care before elective surgery in a large medical institution.
- Increase the number of adult CVS patients completing oral care before elective surgery in a large medical institution by providing an intervention of information and dental supplies.

**Project Objectives**

While there are multiple objectives to complete this QI project, the primary objectives are to collaborate with nursing, the Health Unit Coordinator (HUC) role and other disciplines to implement this project and influence patients. Also, evaluation to analyze if the implemented intervention created a positive change.

- Create and distribute oral care patient education flyers.
• Partner with CVS preop providers and nursing staff to share evidence on oral care completion and impact HAP risk reduction; the aim is for nurses to discuss this with patients.

• Partner with HUCs in the preoperative waiting area (PWA) to place the survey on adult elective CVS patient charts.

• Partner with CVS preop nursing staff to administer the patient oral care flyer and dental supplies.

• Partner with nursing staff in the PWA to assist with reading the permission to participate, have the patient complete the survey questions, and turn them into the confidential survey envelope.

• Obtain and store dental supplies, specifically a toothbrush and toothpaste.

• Influence the patient’s behavior to oral care completion by providing information and dental supplies while reducing barriers.

• To evaluate the project, patients complete a survey when reporting to the PWA before elective CV surgery, with the goal of 100 patients preintervention.

• To evaluate the project, patients complete a survey when reporting to the PWA before elective CV surgery, with the goal of 100 patients in the intervention phase.

• To evaluate the project, tally and compare the survey responses from the preintervention and intervention phases for questions one and two.

• To evaluate the project, tally survey responses for questions three through five in the intervention phase to determine if the intervention was a value add to aid in oral care completion.

Framework
Theoretical Framework

The application of a nursing theory to a QI project will inform the practice problem and project elements. Butts and Rich (2018) share that theory and practice are interrelated. Nola Pender’s middle-range nursing theory's theoretical framework, the Health Promotion in Nursing model (HPM), can support and inform the practice of this identified practice problem of oral care before elective surgery. This nursing theory illustrates that nursing has a role in guiding patients to understand and take steps to make advantageous choices and be proactive in self-care (Petiprin, 2016). The HPM theory helps patients with their individual decisions and behavior to prevent illness (Petiprin, 2016). By performing oral care and diminishing the chance of postoperative pneumonia, it equates to promoting an individual patient's health. This HPM theory resonated and supports the DNP QI project to prevent postoperative infection and promote health by completing oral care before elective surgery. Patients need to understand the rationale of why oral care before surgery is necessary. This understanding happens through intentional conversations and education. Once this information is shared and patients understand, this may help drive behavior change on an individual level and promote health while protecting patients.

The purpose of the HPM is for nursing to connect variables, choices, health behaviors, and outcomes and how nursing as a profession can influence and motivate patients (Petiprin, 2016). The HPM, by Pender, is thought to be a counterpart of the health protection model (Petiprin, 2016). The health protection model highlights distinctive elements that the HPM theory describes as individual characteristics and experiences, behavior-specific cognitions and affect, and behavioral outcomes (Petiprin, 2016). This HPM theory also underscores how individuals and their past experiences can predict future behavior, barring no barriers are present (Pender et
In general, brushing teeth is a routine daily living activity, and people do not associate oral care with previous negative experiences. Therefore, this prior oral care experience should not prevent oral care from occurring. However, patients may be nervous before elective surgery, and brushing their teeth may not even enter their minds.

Regarding perceived barriers, not having oral care supplies may be one barrier, especially if patients were traveling and forgot their oral care supplies at home. If patients are provided the supplies, the perceived barrier would be eliminated and potentially prevent the omission of oral care completion before surgery. Patients should understand the positive health benefit that this familiar and straightforward intervention of brushing their teeth could provide (Spreadborough et al., 2016). This information and lack of perceived barriers should impact the individual’s understanding and promote their health behavior by preventing illness.

When nurses have intentional conversations with their patients about the importance of oral care before their elective surgery and provide information, this action can drive behavior change. Patients should be aware of postoperative pneumonia’s impact on morbidity, mortality, prolonged hospitalization, cost, and quality of life. This conversation between the nurse and the patient increases the likelihood that a patient will brush their teeth before coming to the hospital for surgery and decrease the possibility of postoperative HAP.

Additionally, providing printed information about the importance of performing oral care before surgery should be a part of the patient's preoperative education materials, including an informational flyer, a message on the PAGs, surgical checklists, and NPO guidelines to help reinforce awareness and influence health behaviors. Once providers and patients understand the connection between oral care and the risk of postoperative pneumonia, this health promotion
theory can work to drive behavior change. Understanding this connection can enhance patient safety first, on an individual level, and ultimately on a larger scale.

There is an organic connection between the Health Promotion Model in nursing and oral care before elective surgery. The HPM utilizes the multifactorial aspects of how individuals relate to their environment and how information can drive behavior change (Pender et al., 2015). Butts and Rich (2018) offer that nursing aims to keep patients safe; this includes aiding in preventing infection and disease. HPM guides nursing to help make the connection between preoperative oral care and the prevention of postoperative pneumonia. This connection will ultimately influence the individual’s health promotion and safety.

**Literature Review**

**Search Strategy**

The initial literature search was completed in collaboration with a medical librarian. The CINAHL database was searched with keywords and strategies including, the use of OR, N3, and Boolean phrases with a combination of keywords, ‘or,’ ‘and,’ and parenthesis. The Scopus database was searched with keywords and strategies, including parenthesis, ‘and’ along with ‘or,’ or ‘w/3’. The keywords utilized for the literature search included: pneumonia, healthcare-associated pneumonia, oral hygiene, oral, mouth, tooth, teeth, hygiene, care, rinse, brush, wash, preoperative and preoperative, cardiac patients, and surgical patient. Keywords were used individually and in combination or with an asterisk noting more word endings. The Scopus search initially resulted in 45 unique articles. The CINAHL search initially offered 77,502 articles but with filtering, resulting in 30 unique articles. Full-text articles were filtered for the English language, although some studies originated in other countries, all within hospital
settings. The initial literature search looked back to ten years, but this was expanded to all-time due to the lack of relevant literature. After a review of these searches, ten articles were included.

Due to the small number of relevant articles found, a secondary literature search was conducted, again in collaboration with a medical librarian, this time, with MEDLINE and Embase databases. The keywords utilized were the same as previously listed with the additional keyword: clean. Strategies included in this search were the use of parenthesis, ‘and’ along with ‘or.’ The Medline database search resulted in 22 articles, and the Embase database search resulted in 39 articles. The secondary search produced some of the same articles as the initial search. The articles that were included ranged from 2002 to 2019, spanning 17 years. Results for both the initial and secondary literature search totaled 136 articles for abstract review.

For a comprehensive search, a google scholar search was completed with the keywords of (preoperative or preoperative) and (toothbrush or tooth-brush or (brush teeth)). This search did not generate any new literature for review. Lastly, a search of the Centers for Disease Control website found guidelines published in 2003 to prevent healthcare-associated pneumonia (Centers for Disease Control and Prevention, 2003).

A third literature search was performed after project implementation to explore oral care literature within the past year. This literature search was completed in the same fashion as the first and second. The third literature search resulted in five articles. None of these five articles offered new information, instead supported literature found in the previous literature search.

The literature review explored existing evidence on oral care completion before elective surgery and patient outcomes to inform the DNP QI project. The PICOT question, looking at providing information and supplies, was also fundamental in guiding the literature search and filtering the volume of literature. The literature reviewed explicitly looked at the adult
populations with a preoperative oral care intervention to find HAP reduction evidence. Overall, there is limited literature on preoperative oral care interventions in adult surgical populations to motivate oral care completion.

There were three themes identified in the literature. One theme found throughout all articles is that dental plaque and flora in the mouth and oropharynx contains bacteria (Akutsu et al., 2009, Bardia et al., 2019, Bergan et al., 2014, Caparelli et al., 2019, Hiramatsu et al., 2014, Houston et al., 2002, Lin et al., 2015, Martin-Loeches & Torres, 2014, Semenkovich et al., 2019, Shigeishi et al., 2016, Spreadborough et al., 2016). Another theme among many of the articles suggested that oral and oropharynx secretions are aspirated while patients are mechanically ventilated, which leads to HAP (Akutsu et al., 2009, Bardia et al., 2019, Bergan et al., 2014, Caparelli et al., 2019, Hiramatsu et al., 2014, Houston et al., 2002, Martin-Loeches & Torres, 2014, Semenkovich et al., 2019, Spreadborough et al., 2016). The third theme with a moderate quality indicates that the oral biofilm can break off during intubation and translocate to the lungs and cause HAP (Bergan et al., 2014). The literature also proposed that preoperative oral decontamination may have a higher impact on preventing HAP than oral decontamination in the postoperative period (Caparelli et al., 2019).

Five articles were specific to the CVS population (Bardia et al., 2019; Bergan et al., 2014; Houston et al., 2002; Lin et al., 2015; Spreadborough et al., 2016). There was evidence to support brushing teeth before elective surgery in the literature available regarding the preoperative oral care intervention in the adult surgical populations. Overall, there is sound evidence with good to high-quality rating, as determined by this author, the critical appraisal guide developed by the University of Alabama, Birmingham (2020), and the Johns Hopkins Nursing Evidence-Based Practice Quality guide (2020).


**Synthesis**

Based on the literature appraisal, there are three important themes of oral care before elective surgery. Those are the use of a chlorhexidine mouth wash, brushing teeth and professional dental cleaning. There was evidence presented for each approach, but the recommendation for brushing teeth before elective surgery is the most feasible and effective recommendation due to the evidence and factors. Of the studies found, there were six articles specific to toothbrushing (Akutsu et al., 2009; Bergan et al., 2014; Hiramatsu et al., 2014; Semenkovich et al., 2019; Shigeishi et al., 2016; Spreadborough et al., 2016). There was useful information to support the concept of preoperative oral care impacting postoperative pneumonia (Shigeishi et al., 2016).

Brushing teeth was mentioned to disrupt biofilm manually and reduce bacteria within the oral flora (Bergan et al., 2014). The articles regarding brushing teeth varied in the frequency of brushing. Some studies included professional cleaning in addition to brushing teeth, while others included the use of CHG; however, it was undetermined what was considered the best approach (Akutsu et al., 2009; Bergan et al., 2014; Hiramatsu et al., 2014; Semenkovich et al., 2019; Shigeishi et al., 2016; Spreadborough et al., 2016). Patients that undergo a professional dental visit before surgery, while beneficial according to the literature (Shigeishi et al., 2016), would incur additional costs and will not be addressed for this project. However, brushing the teeth is a more common practice, and it is considered a cheap and easy intervention. An Infection Prevention and Control (IPAC) consultant points out that there are clear benefits to brushing teeth before surgery (personal communication, February 10, 2020). Bundling of a toothbrush and toothpaste and an informational flyer is a low-cost intervention that would aid as a visual reminder for patients to brush their teeth before surgery. The literature does inform the DNP QI
project that the mechanical breaking up of biofilm, specifically brushing of the teeth, is an obvious tactic to decrease bacteria and reduce the risk of postoperative HAP.

Shigeishi et al. (2016) describe how instructing patients can influence change related to oral health behaviors. While there was minimal literature around education, this study has a moderate level of evidence and a good quality rating. This unique finding leads the author to believe that printed materials for patient education are a value add.

There is a strong level of evidence in the literature with a good quality rating that oral care in the preoperative environment is beneficial. Bardia et al. (2019) highlight that HAP is a familiar problem after CVS. Five of these studies validate that preoperative oral care is beneficial in reducing HAP in the CVS population (Bardia et al., 2019; Bergan et al., 2014; Houston et al., 2002; Lin et al., 2015; Spreadborough et al., 2016). Brushing teeth is considered cost-effective and easy to follow as it is a common practice; it shows benefits and evidence that it is safe for patient care before surgery. The third and last literature search was performed going back one year. The literature aligned with and supported the previous literature review findings. Based on the literature review, the preoperative intervention of brushing the teeth before surgery is feasible to move forward in the CVS population.

**Project Implementation**

**Stakeholder Engagement**

Stakeholder buy-in was needed for this DNP QI project. This healthcare institution supports innovation and evidence-based practice. Again, the available literature spoke of three key patient populations where oral care before elective surgery is warranted, and CVS is one of those populations. The DNP student approached a Cardiovascular (CV) surgeon about the oral care project and discussed the potential risk reduction for HAP. A CV surgeon supported the oral
care project concept, yet there needed to be an endorsement by the majority of the CV surgeons. The oral care project was presented to the CVS division by the DNP student, where there was consensus for the project to be implemented with adult elective CVS patients. At that meeting, one CV Surgeon shared that "Patients’ prep their skin, they prep their nares, it makes sense to clean their mouths" (personal communication, July 24, 2020). Once endorsement was gained at the CV surgeon division, a meeting with the nurse practitioner (NP), physician assistant (PA) staff, and nursing staff was established.

When meeting with the NP/PAs and nursing staff, the oral care project was presented. Literature sources were highlighted to understand the relationship between oral care completion and the risk reduction for HAP. This stakeholder engagement meeting described the nursing staff’s role in providing oral care information and supplies to the patient at their preoperative appointment. The DNP student assessed the nursing staff for interest and readiness to change.

Around the same time, the DNP student met with the preoperative waiting area (PWA) nursing leadership team (NLT). At this meeting, the project’s goals were shared. Additionally, the registered nurse (RN) and the Health Unit Coordinator (HUC) in the PWA role would be critical for this project. The paper survey was placed on charts by the HUC, and the RN explained the survey, provided the opt-out option, and allowed the patient to answer questions. Further, the RN returned the completed survey to a confidential envelope at the nursing station. Throughout the QI project, both the HUC and RN had vital roles. One benefit to the QI project was the supportive nursing leadership and their assistance in sharing the DNP student's communication strategies.

The DNP student met with the HUC supervisor to discuss the oral care project. The survey was reviewed, and the supervisor agreed that the HUC role could place the oral care
survey on the elective CVS adult patient’s chart. It was important for the HUCs to understand this QI project's scope and that it would include patients coming into the hospital and excluding patients already hospitalized.

The DNP student met with the Desk Operations staff (DOS) supervisor in the preoperative appointment area. The goal was to discuss the DOS's role in the oral care project. The DNP student met with them in their work environment, discussed the oral care project with the DOS's and answered questions. After stakeholder engagement meetings occurred, the DNP student scheduled observation time in both the PWA and the CVS clinic site, where the patients are seen for their preoperative appointments.

Institutional Review Board (IRB)

An IRB application was submitted at the healthcare institution where the DNP QI project was implemented and at the academic University where the DNP student was enrolled. Both sites deemed the project as quality improvement, not research. Two IRB amendments were submitted to the academic University’s IRB. Both IRB amendments reflected changes to the survey. One amendment was regarding the survey and changing the wording of informed consent to the permission to participate statement and the process of the patient completing the survey. The other change to the survey took a one-page document with an image to a two-sided form without an image; instead, it was colored blue. Both IRB amendments were approved.

Observations

DNP nurse leaders are experts in patient safety and advancing nursing practice. Observations in both the PWA and clinic setting were important to this project as it is a nursing-centric intervention. For a successful QI project, a DNP nurse leader must engage stakeholders, understand the workflows, and identify any potential barriers.
To facilitate workflow process understanding, the DNP student scheduled observation in the CVS preoperative area. The preoperative appointment observation happened first to understand the nursing workflows. Patients are seen the day before surgery, and the RN provides education and information during their appointment. The DNP student sought an understanding of what the patients were told at their preoperative appointment. This information was essential to understand if the intervention of oral care information and supplies would be a good fit for the nursing workflow in this area.

After observing the CVS preoperative appointment setting, the DNP student met with the RN and the NP regarding the proposed QI intervention and the workflow fit. There was a shared agreement with both the nurse and the NP about the intervention's fit. It was then determined that the oral care information and chlorhexidine instructions could be bundled together at the same time during the appointment. An intentional conversation during the appointment with the patient would include prepping the skin to prevent surgical site infection and prepping the oral cavity to decrease the risk of HAP.

The next observation occurred in the PWA to assess and understand workflows, identify any potential barriers, and seek nursing staff engagement. The DNP student shadowed an RN in that area and observed nursing workflows and the patients' flow from the first case to subsequent cases. A discussion occurred between the DNP student and the nurse regarding the oral care survey and exchanging of thoughts on how it could stand out from the other paperwork on the chart.

**Project Intervention**

Oral care completion before elective surgery may reduce the risk of HAP to some degree. Currently, there is no available information to direct preoperative patients in completing oral care
before elective surgery. Additionally, there was a lack of available patient information to understand oral care completion and its importance. Knowing that there is variability in oral care completion before elective surgery, there was a need to collect baseline data, via paper surveys, on the number of patients who brushed their teeth within four to six hours of surgery. Therefore, a patient information flyer and a five-question survey were created for the project.

The informational flyer, the oral care survey, and the supply bag label were created in partnership with patient education to align with institutional requirements. Any patient-facing form needs to be written at a fifth-grade reading level that is easy for all patients to understand. Therefore, patient education consultation was necessary.

The informational flyer is essential to create an understanding of the relationship between oral care and the risk of HAP. During the intervention phase, the RN in the preoperative appointment area provided the patient with the informational flyer and dental supplies. During this preoperative appointment, the oral care intervention was bundled with the chlorhexidine skin prep instructions. The RN was asked to have an intentional conversation about the importance of oral care before elective surgery. The HPM in nursing theory illustrates the nurse's role in leading patients to understand and take steps to make good and healthy choices and be proactive in self-care (Petiprin, 2016). When patients understand the relationship between oral care and HAP risk reduction, this can influence their decisions, health behaviors, and personal outcomes, underscoring the HPM theory's fit with influencing and motivating patients (Petiprin, 2016).

This HPM theory also suggests that individuals and their past experiences can predict future behavior, barring no barriers are present (Pender et al., 2015). When patients are preparing for CVS, brushing their teeth may not cross their minds the morning of surgery. Patients may even think that they should not brush their teeth as they are following NPO guidelines. Both the
informational flyer and the supply bag label serve as a physical reminder to prompt patients to brush their teeth the morning of surgery before reporting to the hospital for elective CVS (see Figure 1).

**Figure 1**

*Informational flyer*

A self-developed paper survey that contained five questions was created (see Figures 2 and 3). An RN administered this survey at the preoperative waiting area (PWA) and read the permission to participate, located on the front side of the survey. The first two questions on the survey's backside were intended to be answered by the preintervention group. Question one was to understand if patients completed oral care in the last four to six hours. Question two was to understand if the patient was provided the dental supplies; however, during the preintervention phase, no supplies were provided.

During the implementation phase, the patient answered all five survey questions. Questions one and two were the same; question three asked patients if they utilized the supplies to brush their teeth prior to coming to the hospital the day of surgery. Question four asked if the
supplies reminded them to brush their teeth and question five asked patients if they would have brushed their teeth without the education and supplies. These questions were asked to understand if providing the intervention of the oral care information and the dental supplies increased the number of patients reporting oral care completion before elective surgery. The surveys also helped identify if the dental supplies were a value add by reminding them to complete oral care.

Figure 2

Patient survey (front side)

![Patient survey (front side)](image)

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Figure 3

Patient survey (backside)
Media support was also consulted in alignment with institutional standards. The media specialist provided expertise and assisted in formatting the oral care informational flyer and the oral care surveys. The media specialist worked with the DNP student to make this simple survey stand out on the patient's chart by printing it on light blue paper.

The supply bag label adhered to the plastic zip-lock bag that contained the dental supplies. Again, the message on the supply bag label was consistent with the informational flyer and served as a visual reminder to brush teeth before coming to the hospital before elective surgery (see Figure 4).

**Figure 4**

*Supply bag label*
Implementation Strategy

The DNP student collaborated with dental specialties for the inpatient oral care project. One potential barrier to oral care may be a lack of dental supplies. This barrier was eliminated by providing dental supplies, including a toothbrush and toothpaste, to every patient. This intervention would allow all patients to receive the same intervention regardless of travel or other unknown circumstances and highlight equity and social justice aspects. The project intervention consisted of dental supplies, yet there were no funds or grants for this DNP QI project. The dental specialty chair personally and graciously donated 100 toothbrushes and 100 travel-size tubes of toothpaste for this oral care project intervention.

Knowing that the supplies needed to be bundled, the DNP student obtained plastic zip lock bags. Labels with a reminder statement were also needed to place on the supply bag. After all of the supplies were gathered and the supply bag label was printed, the DNP student packaged the dental supplies into a zip lock bag. The zip lock bag was then labeled with the reminder message (see Figure 5). These supplies were kept in a locked office until project implementation. At project implementation time, the DNP student distributed supplies, checked them regularly, and refilled them as needed.

Figure 5

Dental supply bag and label
The DNP student created a PowerPoint about the DNP QI project oral care before elective surgery. Three copies were printed and placed into flip charts. One flip chart was provided to the preoperative appointment area, and two were provided to the PWA at two different nursing stations. The flip charts served as a project reference and had the DNP student's contact information available if any questions arose.

At project go-live, the DNP student attended the huddle reports at the PWA to provide a verbal project overview and review the HUC and RN roles. The DNP student pointed out the PowerPoint at the nursing station as a reference and where the data collection envelope was located. A one-page electronic document was provided for the PWA newsletter; one hard copy was printed for the charge nurse station. The DNP student rounded in the area at least three times per week to answer questions and collect the oral care surveys.

**Data Collection**

The baseline information was collected by having patients complete questions one and two on the oral care surveys. The preintervention phase lasted for about one month. The DNP student transcribed the survey responses onto an electronic excel sheet divided into the preintervention and intervention sections. The aim was to get 100 patient completed surveys in
the preintervention phase. The total number of completed surveys in the preintervention phase was 93. Data collection was ended early as a Covid-19 surge was affecting the number of elective surgical patients.

The intervention phase started mid-November, and the aim was to collect 100 completed surveys. Data collection was initially set for about one month; however, the project end date was extended until the end of the month to obtain additional completed survey responses. The total survey responses for the intervention phase were 77.

Evaluation

Data Analysis Methods

An excel sheet was utilized to track, compare, and display the results. Percentages were calculated with each question in the pre-intervention, which were questions one and two. Percentages were also calculated with all five questions in the intervention phase. The preintervention oral care completion rates were compared to the intervention oral care completion rates to analyze the intervention's effects.

Presentation of results

The total number of survey responses for the preintervention phase was 93. In the preintervention phase, 83 patients, or 89%, reported on the self-developed survey that they completed oral care in the previous four to six hours. The intervention phase had a total of 77 completed surveys. In the intervention phase, 77 patients or 100% reported on the self-developed survey that they completed oral care in the previous four to six hours. The completion rate rose by 11% by calculation (see figure 6).

Figure 6

Oral care completion rate comparison
Question number four on the oral care surveys asks the patient if the informational flyer and supplies provided a reminder for oral care completion. The survey responses were almost equal (see results in Figure 7).

**Figure 7**

*The patient perspective of dental supplies*

**Interpretation of results**
The completion of oral care before elective surgery is important as germs in the mouth can reproduce every four to six hours (Quinn & Baker, 2015). Intubation through an unclean oral cavity can lead to germs migrating to the lungs causing HAP (Davis & Finley, 2012). The intervention of providing an informational flyer and dental supplies along with an intentional conversation increased the number of patients reporting oral care completion before elective surgery. In the self-developed survey results in the interventional phase, 77 patients or 100% of patients reported oral care completion before elective surgery. The dental supplies were utilized in 68% of the patients, and only half of the patients reported that the oral care supplies served as a reminder for them to brush their teeth. When the elective CVS patients were asked if they would have brushed their teeth without education and supplies, 74 patients or 96% reported that they would have, and only three patients or four percent of patients reported that they would not have brushed their teeth (see figure 8).

Figure 8

Patient-reported intervention influence

Since information is not provided to the patient preoperatively, providing an informational flyer helps to create that understanding of the importance of oral care. This
informational flyer, coupled with the intentional conversation, builds that understanding and motivates the behavior towards oral care completion. The dental supplies break down the barrier of not having supplies if patients travel from home and provide equity for those who may not have or may not have optimal dental supplies at home. Eighty-nine percent of pre-intervention patients and 100% of intervention patients brushed their teeth. This intervention was effective to an extent as it brought awareness of the potential for a postoperative HAP complication. The information and intentional conversation seem to have positively impacted the reported oral care completion rate.

**Limitations of project**

This project had limitations. One limitation of the project was the timing of the 2020 Covid-19 pandemic. The Covid-19 pandemic emphasized social distancing and masking directives. These directives changed the way that healthcare was delivered to a degree and impacted meeting with individuals. Masking has added a communication complexity as it can impact hearing of what is being said and removes lip-reading ability. Due to social distancing, the DNP student could not meet with small groups in a quiet place free from distraction for discussing the QI project. The DNP student attended the huddle report at the nursing station and provided a brief overview of the QI project, sharing the nursing staff’s role in survey administration and data collection. While discussions at the nursing station worked, it was not the ideal environment. An additional Covid-19 related limitation included an ICU moving down to the PWA area, disrupting the typical workflow for staff engaged in this pilot project. The PWA is a fast-paced environment with multiple staff and roles. The addition of an ICU that operates 24 hours a day changes the dynamic of the environment to an extent.
A second limitation was the project implementation start date was delayed. Due to a needed consult with media support to assist in formatting patient-facing forms, this also triggered a need for an IRB amendment for the forms’ changes, not once but twice. The IRB amendments happened fairly quickly, yet it was unplanned and did delay the start date.

A third limitation is the sheer volume of nursing staff and HUCs involved with the project. In the PWA alone, there were 144 nursing staff and 21 HUCs. The DNP student could not meet with all of these individuals to deliver the evidence, the aim, and the ask of the QI project.

A fourth limitation occurred when the DNP student learned that some elective CVS patients were not surveyed. The reason for this gap is not fully understood. The number of completed surveys in the preintervention phase and intervention phase were not equal.

A fifth limitation occurred when the supplies that were provided by the dental specialty chair had run out. Four patients in the intervention phase, or five percent, reported not receiving the provided dental supplies. It is unknown if this was a reporting error or a gap in the dental supplies.

One last limitation is it was difficult to discern if all eligible patients were administered and filled out the oral care survey. This process may be more streamlined and desirable if the oral care documentation were in the electronic medical record (EMR) rather than a paper-based intervention and relying on staff to place it, collect the data, and return it to an envelope. Leveraging the EMR creates efficiency as it does not require someone to take extra steps to ensure work is done. Waldrop et al. (2014) share that interfacing with an EMR is important to capture documentation items. In the future, a plan, do, study, act (PDSA) cycle (Speroff &
O’Connor, 2004) of building an oral care documentation cell in the preoperative navigator within the EMR would be ideal for documenting oral care completion.

**Discussion**

Evidence in the literature about postoperative pneumonia points to the oral cavity as being a potential risk if not cleaned before intubation. The literature provides compelling evidence of adverse postoperative HAP outcomes, such as increased length of hospitalization and substantial costs (Baker & Quinn, 2018; Chughai et al., 2017; Spreadborough et al., 2016; Thompson et al., 2006). HAP is also known to contribute to morbidity and mortality (Baker & Quinn, 2018; Chughai et al., 2017; Spreadborough et al., 2016; Thompson et al., 2006). While this QI project did not examine HAP rates or postoperative patient outcomes, it did establish baseline oral care completion, which is a starting point to combat HAP. Additionally, the intervention of providing information and dental supplies did increase the number of patients in the intervention phase that reported oral care completion. The literature found and appraised for this QI project found a study that spoke to educational information but did not find literature focused on providing dental supplies and information to motivate patients to complete oral care before elective surgery. Also, there was little found in the literature to support only brushing the teeth to reduce HAP’s risk. Most of the literature found included chlorhexidine solution of different strengths combined with brushing teeth to reduce the biofilm and germs in the oral cavity to reduce the risk of HAP.

Currently, oral care information is not provided to the patient in the preoperative appointment. Providing an oral care informational flyer helped create that understanding for patients on the importance of completing oral care. Providing the informational flyer, coupled with the intentional conversation, builds that understanding and can motivate the patient’s
behavior towards oral care completion. Providing the dental supplies will omit the barrier of not having supplies if patients are traveling far from home and provide equity for those who may not have or may not have optimal dental supplies at home. The dental supplies, however, were not utilized in all patient reports. Only about 68% of the time were the dental supplies utilized. Ninety-six percent of the patients reported that they would have completed oral care before elective surgery without the supplies. While this intervention was an approach to provide everyone the same information and dental supplies, 96% of the intervention group patients reported that they would have completed oral care independently without the oral care information and supplies.

Nonetheless, this intervention would have been helpful in 11% of patients in the pre-interventional phase and was helpful in four percent of patients in the implementation phase. While that number is low, one incidence of HAP adds additional costs to both the patient, the health care institution, and the overall utilization of health care access. HAP can also impact a patient’s overall health, mobility, and quality of life (Baker & Quinn, 2018; Thompson et al., 2006).

There were no incentives given upfront to the staff for project involvement in the QI project. Instead of an incentive, the DNP student interested staff in the QI project by highlighting the patient safety aspects. The majority of the staff were engaged in this QI project.

While not evident in this literature review, one concern is that brushing teeth can cause some trauma to the gums. According to the IPAC physician, the benefit of brushing teeth outweighs the risk (personal communication, February 2020). He also shared that brushing teeth would cause no more gum trauma than eating food with a rough texture (personal communication, February 2020).
Project success can be measured in different ways. Moran et al. (2020) describe how success is a result of planning. This project stayed on the projected timeline, was low cost, and could have substantial cost savings; these elements are mentioned by Moran et al. (2020) as a measure of success. Based on the self-developed survey results, the instructions and supplies did influence the number of patients who reported oral care completion before arrival to the hospital the morning of surgery. The intervention group's oral care completion was 100% and had an 11% increase from the preintervention group.

**Recommendations**

**Implications for Nursing Practice**

The DNP-prepared nurse is in a position to influence nursing practice as they have knowledge and experience in nursing practice (AACN, 2006). Further, they understand the nursing practice complexity and provide patient safety expertise (AACN, 2006). If nursing staff cannot see the data on patient outcomes, they may be unaware of how they can impact a system-level practice issue.

The oral care intervention aligns with a system-level issue that impacts the institution's infection mitigating goals and reduces patients' HAP risk. When nurses understand the importance of oral care before elective surgery and how that correlates to risk reduction with postoperative HAP, they will be more apt to educate their patients. The HPN theory highlights that nursing has a role in guiding patients to understand and take steps to make good choices and be proactive in self-care (Petiprin, 2016). When nursing staff has been presented with the evidence on oral care completion and how that can reduce HAP risk, they will be motivated to impact patients' care positively. Intentional conversations between a nurse and a patient can have a lasting impact on patient behaviors and patient choices (Petiprin, 2016). Further increasing
patient safety by reducing the risk of HAP will assist in hospital utilization, specifically the patient flow indicator regarding the patient’s length of stay (Penner, 2017). Additionally, HAP reduction will decrease the cost to the patient and the costs to the institution.

DNP-prepared nurses bring a level of expertise to assist in identifying practice issues. DNP-prepared nurses also advocate for nursing practice and seek to gain stakeholder buy-in by meeting with nursing groups to understand their awareness of the practice issue and scope. 
American Association of Colleges of Nursing (AACN) (2006) Essentials of Doctoral Education for Advanced Nursing Practice underscores that a QI project should improve outcomes that are important to both the patient and the health care system (AACN, 2006). If a QI project is important to a healthcare organization and a patient, it is equally important to nursing staff. Incentives for nursing staff are that they can increase patient safety and outcomes. When nurses buy-into a QI project, this can lead to project success and sustainability. Waldrop et al. (2014) highlight that a QI project should match the patients' values and equate to favorable outcomes.
This DNP QI projects aim to spread best practices to other surgical practices, improving patient care and institutional outcomes.

Nursing Knowledge Development

The DNP role can influence nursing practice as they have wisdom and expertise and can identify gaps (AACN, 2006). Further, the DNP role can provide leadership by utilizing the evidence to solve identified practice issues by applying the evidence to bridge the practice gap. The experienced DNP nurse leader is in the top rank of leadership (AACN, 2006). The DNP leader oversees the QI process and can lead and evaluate PDSA cycles to understand when small tests of change work to enhance patient outcomes. When completed by an experienced DNP
nurse leader, this QI process can impact the institution, optimize patient safety, and advance nursing practice.

Providing evidence on oral care and HAP risk will help the RN understand the relationship between oral care and HAI’s. Once nursing understands this, they can pass this information on to the patients by having intentional conversations with them. When patients are guided to understand the importance of oral care, they can make advantageous choices and be proactive in self-care (Petiprin, 2016). The HPM theory helps nursing to connect variables, choices, health behaviors for patients (Petiprin, 2016). Nursing, as a profession, utilizing the HPM theory can influence and motivate patients with their individual decisions and behavior to prevent illness (Petiprin, 2016). Oral care is an everyday hygiene activity, yet the risk of infection if omitted is real. Nursing is known for patient advocacy, and increasing their knowledge by way of education, will provide intrinsic motivation to safeguard their patients. Performing oral care and diminishing the risk of postoperative pneumonia can equate to promoting an individual patient's health.

The intervention of information and dental supplies was provided to each patient in the intervention group regardless of social determinants of health or travel status. Providing supplies to all patients in the intervention phase was done intentionally to provide each patient with the same intervention for an equal opportunity. While not all patients utilized the dental supplies, they all received the information, which influenced patients as 100% of the intervention group achieved oral care completion four to six hours before elective surgery.

Project Summary

Summary of Recommendations
The educational flyer was a value-add intervention and is recommended to provide to all elective surgical patients. Bundling of the oral care information and supplies with chlorhexidine instruction and supplies fit nicely in the nursing workflows. Dental supplies, including a toothbrush and toothpaste, helped remind about half of the patients to complete oral care before elective surgery. Of the oral care intervention group patients, 68% reported that they utilized the dental supplies, whereas 32% did not utilize them. Having a toothbrush and toothpaste are common, and most people have these supplies. Therefore, it is not recommended to provide these dental supplies to all patients. Instead, offering them to all patients and providing them when needed will reach the patients who forgot them at home, who may not have supplies, or who may not have optimal supplies. When bundled together, the dental supplies cost $2.22, including the informational flyer, and providing them when needed is feasible. The literature shows that one incidence of HAP can be costly. However, this cost varies per patient and institution, so it is unrealistic to attach an exact dollar amount to this cost analysis. However, an upfront cost of printed materials and supplies when needed is far more cost-effective than one case of HAP.

Having the oral care messages in multiple printed materials such as the oral care informational flyer, PAGs, NPO guidelines, and surgical checklist is considered beneficial to remind patients to complete oral care. Further bundling the chlorhexidine information and supplies with the oral care information and supplies is an important first step. However, to drive the message about oral care importance home, an intentional conversation with patients is needed as a second step. The message about prepping their skin to prevent surgical site infection and prepping their mouth to reduce the risk of HAP is considered an effective intervention.
Lastly, the study was not designed to measure HAP rates. A replication study would lead to more generalizable results and strengthen the validity of the project. A replication study could measure a group of participants pre-intervention and post-intervention. The surveys would include medical record numbers on the patient’s survey. Having the clinic numbers would allow gleaning more information by going beyond baseline reported oral care completion aggregate data. The additional information would be obtained by drilling down into the patient's electronic medical record to look for a medical diagnosis of post-op HAP. This information would provide a clear correlation if the oral care completion before elective surgery reduced postoperative HAP rates.

Conclusions

The survey data suggests that intervention of providing oral care information, dental supplies, and the nurse having an intentional conversation with the preoperative patient did motivate patients to complete oral care before elective surgery. The intervention group had an 11% increase in the number of patients reporting oral care completion before elective cardiovascular surgery. The simple and cost-effective intervention of patients brushing their teeth before elective surgery could reduce the number of microbes in their oral cavity and lessen the risk of HAP (Chughai et al., 2017).
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