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Improving the Care of Patients with Urinary Catheters Through a Quality Improvement

Ashley Nicole Holmstrom
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral study by

Ashley N Holmstrom

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Review Committee
Dr. Trinity Ingram-Jones, Committee Chairperson, Nursing Faculty
Dr. Anna Valdez, Committee Member, Nursing Faculty
Dr. Deborah Lewis, University Reviewer, Nursing Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2018

Abstract

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by

Ashley N. Barnes-Holmstrom

MSN, Walden University, 2012

BSN, Baylor University, 2009

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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November 2018

Abstract

Catheter-associated urinary tract infections (CAUTI) significantly increases patient morbidity and mortality, length of stay, and organizational cost. In the 2 years prior to project implementation, the incidence of CAUTI increased by 15% in the local acute care, inpatient facility that served as the project site. Nursing leaders at the project site linked the increase in CAUTIs to a nursing knowledge deficit related to CAUTI prevention principles. The clinical question focused on the impact of CAUTI prevention staff training on the incidence of CAUTI, length of stay, and cost to the local acute care organization. After a review and critical appraisal of the literature, using Lewin's theory of planned change and the Iowa Model of Evidence-Based Practice Change, an evidence-based, CAUTI-prevention training program was piloted as a quality improvement initiative. The project purpose was to evaluate that initiative by tracking the incidence of CAUTI for 90 days postintervention. A 1-sample t-test of the mean incidence with a 95% confidence interval revealed no statistically significant (p = .732) decrease in the incidence of CAUTI. Similar initiatives with fewer than 12 months of evaluation data have failed to demonstrate statistically significant findings; therefore, additional data are needed to adequately assess the impact of the project. Recommendations include extending the pilot project and additional training of unlicensed nursing personnel. Proper evaluation of the project may provide support for the implementation of CAUTI-prevention training programs, promoting social change by reducing the rate of infection, improving patient outcomes, and demonstrating financial stewardship of the local acute-care organization.

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Dedication

This project is dedicated to my mother, April Jerice Barnes, the best mother anyone could hope for. You have been an exemplary role model throughout my life. Thank you for setting the example for me and pushing yourself to complete college despite the odds. I am forever grateful you taught me to be a strong, assertive, and giving person. Those qualities have served me well in my personal life and in my career as a nurse and a leader. Because of your influence, I live to serve others and work to be a blessing to those I encounter, far and near. I do these things in the Lord's name, and He has blessed me with you, an angel, to lead me and love me in all that I do. This work is, truly, a labor of love for you, Mom.

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I would like to thank Dr. Trinity Ingram-Jones, Dr. Cynthia Cook, Dr. Cheryl McGinnis, Rodney Turner, and the all the Walden University staff for their support on my doctoral journey. You may never fully understand what your support and leadership has meant to me. I would also like to thank my doctoral preceptor for enthusiastically accepting the challenging task. Truly, you are an amazing example of executive nursing leadership! I would also like to express my heart-felt appreciation to my amazing family and friends for their love and support on this journey. Cameron, my love: Thank you for the many sleepless nights you endured to ensure I was awake to complete papers, assignments, and projects. God simply could not have blessed me with a better husband, confidant, and friend. Truly, I have been so blessed to have a wonderful team of loved ones supporting me as I navigated this long, but worthwhile, journey. Earning this degree has equipped me with the best tools to lead my chosen profession and improve the care nurses provide to those we serve.

Table of Contents

List of Figures

Section 1: Nature of the Project

Introduction

Infections of the urinary tract account for approximately 40% of all nosocomial infections in the United States (Fink et al., 2012; Institute for Health care Improvement [IHI], 2017). Caused in large part by the insertion of urinary catheters, these preventable infections result in approximately 13,000 deaths and expenses exceeding $400 million annually in the United States (Bernard, Hunter, & Moore, 2012; IHI, 2017; Knudson, 2014; Leone, 2012; Meddings et al., 2012; Modica et al., 2014; Panchisin, 2016; Umer, Shapiro, Hughes, Ross-Richardson, & Ellner, 2016). In 2008, the Centers for Medicare and Medicaid Services (CMS) led an effort to prevent nosocomial infections by initiating pay-for-performance initiatives, which directly linked reimbursement to quality of patient care (James et al., 2012; Palmer, Lee, Maya Dutta-Linn, Wroe, & Hartmann, 2013). Consequently, CMS and other payers began refusing reimbursement to health care providers and organizations for care linked to treatment of nosocomial infections, creating a substantial financial burden for the treatment of a single infection (Zimlichman et al., 2013). With financial stability at risk, many leaders of U.S. health care organizations rapidly moved from a treatment to prevention-focused model of care by implementing evidence-based strategies to prevent these infections (Zimlichman et al., 2013). Considering the safety, quality, and financial burden CAUTIs deliver, it was important for the pilot organization to focus on preventative ways to combat CAUTIs and their associated outcomes.

In the 2 years preceding implementation of the Doctor of Nursing Practice (DNP) project, the incidence of nosocomial catheter-associated urinary tract infections (CAUTI) in the local acute care, inpatient facility that served as the project site had increased by 15%. Staff from the facility's hospital education, infection control, and quality management teams attributed this increase to a nursing knowledge deficit related to current, evidence-based, prevention principles. Organizations that provide structured, evidence-based CAUTI prevention training to their nurses report higher levels of staff adherence to preventive measures, fewer infections, reduced lengths of stay, better patient outcomes, and reduced organizational expenses (Cherry, Brown, Bethell, Neal, & Shaw, 2012; Flodgren et al., 2013; Ho, Tse, & Boost, 2012; Iacono, 2016; Koo et al., 2016; Meddings et al, 2012). For these reasons, leaders of the local facility implemented such a program on January 22, 2018 as a small-scale, quality improvement (QI) pilot project on the two nursing units with the highest incidence of these infections in the facility. Through this pilot project, the leaders at the local facility aimed to improve staff education and reduce the incidence of CAUTIs and the negative outcomes associated with the infections.

The purpose of this DNP scholarly project was to evaluate the impact of that project on the incidence of CAUTI, as well as the associated length of patient stay and cost to the organization. Although implementation of similar quality improvement programs have demonstrated success addressing the identified practice problem and gap-in-practice, evaluating the efficacy of QI programs, similar to the pilot program in the local setting, is essential in determining if the intended outcomes are achieved (Cherry et

al., 2012; Flodgren et al., 2013). Quality improvement programs similar to the one at the project site can also assess replicability in similar practice settings and patient populations (Ho et al., 2012; Iacono, 2016; Koo et al., 2016; Meddings et al, 2012; White, Dudley-Brown & Terhaar, 2016). Empowering nursing staff to prevent nosocomial CAUTI through education at the local organization and in other acute care inpatient units and facilities across the United States may create the potential for positive social change at the local, state, and national levels by reducing morbidity, mortality, and overall cost of health care (Cherry et al., 2012; Finan, 2012; Flodgren et al., 2013; Ho et al., 2012). As this project begins to review the local problem and relevance associated with the impact of CAUTIs at the acute care facility, there may be a potential to implement changes into practice that yield positive patient outcomes on a local and global scale.

Problem Statement

Local Problem and Relevance

In an effort to improve the quality of care and patient safety while reducing patient morbidity and mortality, the incidence and spread of antibiotic resistant bacteria, and the financial impact of pay for performance initiatives instituted by CMS and other insurers, leaders of the local facility instituted evidence-based, CAUTI prevention initiatives in 2013, according to a quality management representative of the facility. Despite those efforts, the incidence of antibiotic resistant bacteria has increased 15% during the 2 years preceding project implementation. The setting's facility controller also noted that, in Fiscal Year 2016, alone, patients acquiring nosocomial CAUTI in the local

facility exceeded their expected length of stay by 119 days, with direct costs to the facility totaling nearly $140,000, reflecting an average of over $9,000 per incident.

According to the facility's leader of nursing education, one of the major initiatives originally instituted in the facility to address the high incidence of nosocomial CAUTI was the incorporation of simple, evidence-based preventive measures into the routine nursing care of patients with in-dwelling urinary. However, nursing education and infection control managers discovered that chart audits revealed that only half of the nursing staff in the facility had incorporated those principles into their routine patient care, and a subsequent root-cause analysis linked the recent increased incidence to that nonadherence. Furthermore, feedback provided by the nursing staff revealed a knowledge deficit related to those preventive principles. Hospital education and quality leaders mostly attributed this knowledge deficit to insufficient evidence-based training opportunities, as formal training opportunities were not offered to nursing staff to introduce these principles they were expected to incorporate into the routine care of their patients with indwelling catheters. Facility educators shared that instead, members of the nursing staff were expected to informally learn those principles during unit orientation with their assigned preceptor.

According to researchers, implementation of formal, evidence-based, nosocomial CAUTI prevention training programs for nurses in similar facilities has positively impacted staff adherence to preventive measures and subsequently reduced the incidence of infection, length of patient stay, and expense to the organization (Cherry et al., 2012; Flodgren et al., 2013; Ho et al., 2012; Iacono, 2016; Koo et al., 2016; Meddings et al,

2012). Based on that evidence, leaders of the local acute care facility recently piloted a similar program as a QI project on the two nursing units with the highest incidence of CAUTI in the facility. Reducing the incidence of these infections as well as their associated length of patient stay and cost to the organization were the main goals of the QI project.

Proper evaluation of QI projects is critical to ensure that the intended outcomes are met, adjustments are made based on the data associated with local implementation, and proper determinations are made regarding replicability across organizations and practice settings (White et al., 2016). In conducting this DNP project, I focused on proper evaluation of the pilot project to determine its impact on the incidence of CAUTI, length of stay, and cost to the organization. Based on that evaluation, I offered recommendations for potential changes to the project, as well as recommendations for organization-wide implementation, to the project team.

Significance to Nursing

Directly linked to substandard nursing care, nosocomial CAUTI is associated with serious complications, increased morbidity and mortality, and significant patient suffering (Andel, Davidow, Hollander, & Moreno, 2012; Centers for Disease Control and Prevention [CDC] 2016; Koo et al., 2016; Meddings et al., 2012). Consequently, leaders from education, quality, and nursing units shared that a nursing knowledge deficit and lack of proper nursing education related to CAUTI preventive measures attributed to a decline in the quality of patient care at the local facility two years prior to project implementation. As a profession, nurses are called upon to improve the quality of patient

care to facilitate the best possible outcomes and reduce the burden of human suffering (Stevens, 2013). Changing outdated or ineffective nursing care practices and implementing practices consistent with the current evidence improves the nursing process, nursing competency, clinical judgment, and patient outcomes, according to Finney, Johnson, Duffy, and Dziedzic (2016). Furthermore, addressing the nursing knowledge deficit facilitates adherence to evidence-based principles, decreases the incidence of CAUTI, increases the quality of care, reduces the burden of patient suffering, improves patient outcomes, and reduces the cost of care (Cherry et al., 2012; Finan, 2012; Flodgren et al., 2013; Ho et al., 2012). The project recently piloted in the local facility was implemented with those outcomes in mind. White et al., (2016) shares that evaluation is a critical component of QI projects to ensure the intended outcomes are achieved. Conducting an evaluation of the local facility's piloted QI program was, thus, the focus of this DNP project.

Purpose

In the 2 years preceding project implementation, education, infection control, and quality management shared that the local facility experienced an increased incidence of nosocomial CAUTI, and chart reviews and root-cause analysis revealed poor nurse adherence to the evidence-based principles intended to prevent these infections. Staff nurses had also voiced concerns with facility leaders regarding the increased incidence, citing a lack of training opportunities related to the current, evidence-based preventive measures they were expected to incorporate into their routine nursing care of patients with indwelling urinary catheters. Until the pilot project was implemented, the nursing

education leader explained that nursing staff in the facility were offered no formal CAUTI prevention education, and each nurse was expected to acquire this knowledge during the unit orientation phase with their assigned preceptor.

Prevention training is an essential component of any organizational plan to reduce the incidence of nosocomial infections (Cherry et al., 2012; Flodgren et al., 2013; Ho et al., 2012). When presented with information shared from meetings with staff and leaders regarding opportunities related to CAUTI prevention, organizational leaders concluded that staff had failed to adhere to CAUTI prevention principles because of a nursing knowledge deficit related to those practices; therefore, CAUTI prevention training was the gap-in-practice requiring attention if the local facility hoped to solve the clinical practice problem.

Utilization of infection control and prevention best practices greatly reduces the risk and spread of nosocomial infections, and the current evidence strongly suggests that education with a focus on prevention increases nursing knowledge, changes nursing practice, reduces the incidence of nosocomial infection, decreases patient suffering, improves patient outcomes, decreases length of stay, and decreases the cost of care (Fessele, Yendro, & Mallory, 2014; Fink et al., 2012; Schelling et al., 2015). To bridge the identified gap-in-practice, leaders of the local facility piloted a CAUTI prevention training program as a QI initiative to introduce current, evidence-based principles for the prevention of these infections to the nursing staff. The program emphasized the importance of the consistent use of these principles in the routine care of patients with urinary catheters. An essential component of any QI initiative, evaluation is critical to

ensuring that the intended outcomes are met (White et al., 2016). In this DNP project, I focused on evaluating the pilot project implemented in the local facility and answering the following clinical question: In acute care in-patient facilities, does CAUTI-prevention staff training reduce the incidence of CAUTI, length of stay, and cost to the organization?

Nature of the Doctoral Project

According to Peterson et al. (2014), an intensive review of the current, scholarly literature focuses on answering the practice-focused question, explores applicable theoretical concepts, and selects appropriate models to guide and frame the practice change, and identifies appropriate methods to evaluate the QI project. My review provided insight regarding the historical background and significance of CAUTI, evidence-based principles to prevent it, evidence-based interventions to address it, and evidence-based methods to evaluate the efficacy of the selected intervention in reducing its incidence (Peterson et al., 2014; Strouse, 2015). Key search terms and Boolean phrases derived from the clinical question were used to search appropriate databases for current, clinical practice guidelines, as well as peer-reviewed, primary sources and systematic reviews published within the past 5 years. The Elton B. Stevens Company (EBSCO) database, Cumulative Index to Nursing and Allied Health Literature (CINAHL), National Guideline Clearinghouse, Cochrane Library, and Ovid were the most appropriate databases used in the literature search to support the project (Strouse, 2015; Terri, 2015). Applicable professional and regulatory websites such as the CDC, Institute of Medicine, Agency for Health Care Research and Quality (AHRQ), The Joint Commission (TJC), World Health Organization, Association for Professionals in

Infection Control and Epidemiology, Society for Health care Epidemiology of America, Society of Urologic Nurses and Associates , and the American Nurses Association were used to search for statistical data, white papers, and evidence-based, clinical practice guidelines and protocols (Strouse, 2015; Terri, 2015). Pre- and postimplementation data extracted from de-identified, quality indicator and root-cause analysis reports provided by organizational leadership were utilized to evaluate implementation of the pilot project in the local facility (Terri, 2015; United States Department of Veteran Affairs [USDVA], 2015).

Information derived from an extensive review of the current literature was organized in a matrix arranged alphabetically by last name of the primary author(s) and included a full citation of the publication, theoretical and/or conceptual framework, methodology, results, and recommendations, as applicable. Critical appraisal of the strength and relevance of the evidence is an essential step in determining evidence-based best practices (Armola et al., 2009; Peterson et al., 2004); therefore, the American Association of Critical Care Nurses (AACCN) evidence-based rating system was used to evaluate and categorize the evidence in the literature review matrix. Designed to reduce bias, meet the objectives of the literature review, and enrich the practice of nursing, the data were critically appraised based on the process established by Taylor and Proctor (2009). Upon completion of this process, Walden University Institutional Review Board (IRB) approval, and approval of the DNP project committee, I undertook evaluation of the QI project implemented in the local facility. This evaluation was based on a synthesis of evidence-based best practices derived from an extensive review of the current,

scholarly literature. Specifically, I sought to determine whether the pilot project implemented in the local facility was effective in reducing the incidence of nosocomial CAUTI and its associated length of stay and cost to the organization (see Koo et al., 2016; Meddings et al., 2012).

Significance

Evaluation is a critical component of QI projects (White et al., 2016); therefore, patients, their families, nurses, organizational leadership, other hospital staff, and the community at large were stakeholders in the DNP project. Directly linked to substandard patient care, nosocomial infections may reflect poorly upon organizational leadership, nurses, and other hospital staff (Andel et al., 2012). CAUTI is associated with serious complications that increase morbidity, mortality, and the overall cost of health care (CDC, 2017; Koo et al., 2016; Meddings et al., 2012). Treatment of these infections and their associated complications are no longer reimbursed by third-party payers, resulting in substantial financial burden that impacts the overall financial stability of the organization (Underwood, 2015). Unfortunately, patients and their families ultimately bear the greatest burdens induced by those complications, including suffering and loss of health, independence, life, and economic resources (AHRQ, 2012). The community at large also holds a stake in effectively addressing the identified practice problem. CAUTI impacts the availability of quality medical and nursing care available to its residents and visitors to the local area, and it has been linked to multi-drug resistant organisms, thereby increasing the risk of infection with these bacteria in the community (Jimenez-Alcaide et al., 2015; Singhai, et al., 2012).

Nursing, as a profession, is dedicated to the provision of high-quality patient care to achieve the best possible outcomes (Stevens, 2013). Implementing evidence-based best practices to solve clinical problems and properly evaluating the impact of those efforts improves the quality of nursing care delivered, yields better patient outcomes, and reduces the cost of care (Finney et al., 2016). The QI project recently implemented at the site facility will improve the quality of patient care outcomes and lower organizational expenses by decreasing the incidence of CAUTI and length of patient stay (Cherry et al., 2012; Finan, 2012; Flodgren et al., 2013; Ho et al., 2012). To ensure that the intended outcomes are met, facilitate replicability, and improve transferability, careful evaluation of the project must be undertaken, and this was the focus of the proposed DNP project (White et al., 2016). Evaluation of the pilot project will inform final implementation across the organization and its larger hospital system and will also be widely disseminated through professional publication, thereby contributing to the larger body of nursing knowledge and evidence-based nursing practice (White et al., 2016). In support of Walden University's goal to promote positive social change through research, practice, and education of the reflective, motivated scholar-practitioner, findings of the DNP project will empower nurses to utilize evidence-based best practices to solve clinical practice problems, reduce human suffering, and decrease the cost of health care (CDC, 2017; Koo et al., 2016; Meddings et al., 2012; Walden University, 2017, Vision, mission, and goals section, para. 4; Walden University, 2017, Vision, mission, and goals section, para. 5).

Summary

Largely attributed to a nursing knowledge deficit related to simple preventive principles in the 2 years prior to implementation of the QI project, facility leaders discovered that the incidence of CAUTI had significantly increased in the local facility. Subsequently linked to a lack of formal training, the local facility recently piloted the implementation of an evidence-based, CAUTI prevention training program as a QI initiative in an effort to address this gap-in-practice. To ensure the intended outcomes of the pilot project were met prior to facility-wide implementation, the DNP project focused on evaluation of that initiative. Findings of the project will promote positive social change by empowering nurses to utilize evidence-based practice to reduce the incidence of CAUTI, which will subsequently reduce morbidity, mortality, economic burden, and patient suffering (Cherry et al., 2012; Finan, 2012; Flodgren et al., 2013; Ho et al., 2012).

Section 2 of this proposal provides an in-depth discussion related to the historical background and relevance of CAUTI, which is the identified clinical practice problem, and its relevance to nursing practice. Previously used strategies to address this problem at the local level are also reviewed in section 2. Related concepts are also shared along with the selected theoretical and practice change models that provided the framework for the DNP project. Composition and role of the project team, as well as my role as a student on that team, is discussed in the following section.

Section 2: Background and Context

Introduction

While quality improvement programs have been effective in improving patient and organizational outcomes (Cherry et al., 2012; Finan, 2012), this was not the case at the local site facility. facility According to the facility finance and quality leaders, a 15% increase in the incidence of CAUTI in the 2 years preceding implementation of the QI pilot project increased patients' length of stay and care costs, which places an even greater burden on the quality of care provided at the site facility (Bernard et al., 2012; IHI, 2017). Leaders of the facility attributed the increased incidence with a nursing knowledge deficit stemming from a lack of formal training on preventive principles nurses were expected to incorporate in the routine care of patients with urinary catheters. To address this knowledge deficit, the facility implemented an evidence-based, CAUTI education program as a QI pilot project on January 22, 2018. The purpose of this DNP project was to evaluate that initiative and answer the following clinical question: In acute care in-patient facilities, does CAUTI prevention staff training reduce the incidence of CAUTI, length of stay, and cost to the organization?

In this section, I will discuss applicable concepts, models, and theories that supported the DNP project, as well as consider its relevance to nursing practice. Historical evidence related to the practice problem will be presented to provide background and context, including trends and actions previously taken by the site facility's leadership and staff to address the gap in practice. I will also explore my role in the project and that of the project team.

Concepts, Models, and Theories

Lewin's Theory of Planned Change

Kurt Lewin, a social psychologist and author, introduced concepts of change theory and contributed to the practice of nursing by describing key actions groups and organizations can take to promote behavior change (Lewin, 1947; Petiprin, 2016). Focused on experiential development, action research, and group dynamics, he sought to change behavior by challenging barriers, setting expectations, and assessing outcomes among groups (Lewin, 1947). Lewin's theory of planned change was used to implement the pilot project in the local facility. Consideration of the stages Lewin (1947) described was imperative to the project evaluation, which was the primary focus of the DNP project. Lewin's theory of planned change is based on the notion that behavior is largely controlled by driving forces, restraining forces, and a state of equilibrium (Lewin, 1947). According to Lewin, change occurs in three stages: unfreezing, change, and refreezing. During the unfreezing stage, opportunities are provided by an organization to allow those affected by the change to let go of the status quo, old habits, and/or ineffective practices (Lewin, 1947). It is during this stage that change agents increase driving forces to change behavior and reduce or eliminate restraining forces or barriers to change (Lewin, 1947). Change is actually implemented during the second stage of Lewin's theory (Lewin, 1947). Incorporating new behaviors while influencing thoughts and attitudes about the change are the focus of this stage (Lewin, 1947). Re-freezing, the final stage of Lewin's theory, is the point at which hardwiring occurs, and the change becomes the "norm" (Lewin, 1947; Petiprin, 2016). Over time, the new practice becomes part of the societal

culture, creating a fertile environment in which to plant sustainable change (Lewin 1947; Petiprin, 2016). In short, Lewin's research provides an avenue for positive change within the site facility as they seek to alter the current trajectory of practice related to CAUTI prevention and therefore improve quality, length of stay, and cost. By incorporating evidence-based strategies into practice and disposing of old and ineffective practices, leadership at the site facility shared that they wish to promote positive change that impacts staff, patients, and the organization. The main goal of the pilot project was to create sustainable change to reduce the incidence of nosocomial CAUTI and decrease its associated length of patient stay and cost to the organization. My project focus was on evaluating whether implementation of the evidence-based, CAUTI-prevention training program was effective in accomplishing that goal and formulating recommendations based on that evaluation prior to organization-wide implementation of the program.

Iowa Model of Evidence-Based Practice Change

The Iowa Model of Evidence-Based Practice Change to Promote Quality Care is a QI model that has been used by nursing leaders to translate research into practice by critically appraising current evidence to support evidenced-based practice change (Brown, 2014; Hanrahan et al., 2015). Incorporated into research, practice, and educational programs, the Iowa model has a significant presence in the literature, as it has been referenced in over 200 bodies of work and has been reviewed more than 11,000 times (Brown, 2014; ResearchGate, 2017; Titler et al., 2001). Its significant presence as a research model, in addition to its ease of use and implementation, emphasis on pilot testing prior to wide-spread practice implementation, and generalizability (Brown, 2014;

Titler et al., 2001), rendered the Iowa model the most appropriate for evaluating the QI initiative in the local facility.

The Iowa model described practice change through a series of steps, the first of which was to identify problem-focused and/or knowledge-focused triggers indicating a need for potential practice change (see Titler et al., 2001). Application of this step revealed a problem-focused trigger: a sharp increase in the incidence of CAUTI within a relatively short time period as described by the facility's leader of nursing education. The second step was to determine whether the issue or topic was a priority for the organization (see Titler et al., 2001). Noting an increased incidence of CAUTI, length of patient stay, and cost to the facility, organizational leadership deemed the problem a priority for the organization to address. The organization's leadership team had several meetings in January 2018 to brainstorm next steps to address the issue of CAUTI. These meetings led to the third step in the process which was to form a team that would work together to assemble related literature and synthesize it for use in practice (see Titler et al., 2001). This step was particularly important to ensure that the proposed change had a sufficient research base and adequately reflected a translation of the best available evidence into practice (Hanrahan et al., 2015; Titler et al., 2001). A review and synthesis of the research and literature, which was completed after the project team was established, revealed evidence-based prevention training programs that had demonstrated efficacy in reducing the incidence of nosocomial infections, length of patient stay, and cost to acute care inpatient facilities (see Cherry et al., 2012; Flodgren et al., 2013; Ho et al., 2012; Iacono, 2016; Koo et al, 2016; Meddings et al., 2012). The first three steps of

the Iowa model allowed the organization's leadership team to align their issue (CAUTI) with literature aimed at addressing that issue to further support their decision to reduce CAUTI, length of stay, and cost, while improving quality of care. The next phase of the Iowa model is to pilot and evaluate the change on a small scale prior to organization-wide implementation (Titler et al., 2001). After selection of a computer- and evidence-based, prevalidated, CAUTI prevention training program, the project team implemented the pilot as a QI initiative on the two nursing units with the highest incidence of CAUTI in the facility. Evaluation, the primary focus of this DNP project, is an essential component of any QI initiative (White et al., 2016). A decreased incidence of CAUTI and associated length of patient stay and cost to the organization were the expected and desired outcomes of the pilot project; therefore, if evaluation indicated achievement of these outcomes, a change in practice would be considered, per Titler et al. (2001). If these outcomes were not achieved, the process would be re-evaluated, and additional literature searches would be undertaken by the project team, following Titler et al. (2001). The final phase of the Iowa model is continuous monitoring and evaluation by the project team to ensure desired outcomes are achieved and deviations are addressed in a timely and efficient manner (see Titler et al., 2001).

Relevance to Nursing Practice

Recognized as the most common and preventable hospital-acquired infection, CAUTI is primarily caused by poor catheter insertion and management practices (Hake, Auret, van Gessel, & Sinclair, 2013; Knudson, 2014). These infections lengthen patient stay, increase morbidity and mortality, and cost over 400 million dollars annually to

manage and treat in the United States (Hanchett, 2012; Panchisin, 2016). Several published initiatives, including simplification of clinical practice guidelines and incorporation of simple preventive measures into routine care of patients with urinary catheters, reflect a national effort to reduce the incidence of CAUTI (ANA, 2016; Gray et al., 2016); however, it remains the only hospital-acquired condition that is not on the decline nationwide (Lo et al., 2014). The local facility is no exception. Despite the implementation of evidence-based interventions aimed at reducing the incidence of CAUTI, quality leaders at the site facility recognized that the number of these infections had continued to rise over the 2 years preceding project implementation.

Facility leaders discussed chart reviews and feedback provided by nurses in the local facility which evidenced staff failure to follow simple preventive measures. Several years ago, the quality management team shared that the local facility implemented tools in 2013 and 2016 to assist the unit nurses with CAUTI prevention efforts; however, until the current QI initiative was implemented, no formal training to introduce these tools and reinforce prevention principles was offered to the staff. Instead, the quality team explained, preceptors were expected to informally educate new hires on the policies and procedures during the unit orientation phase. Nursing leaders in the organization shared that they previously attempted to address the lack of formal CAUTI prevention training by informally talking with staff during daily nurse leader rounds regarding the appropriateness of in-dwelling catheters and the importance of assessing their positioning and cleanliness. Members of the quality management team also provided informal verbal guidance to nursing staff and leadership regarding infection prevention strategies by way

of “just-in-time” education. While those efforts may have slightly reduced the incidence of CAUTI on some units in the facility, the quality management team found that most units had an increase in the number of these infections. Further, those tactics created staff reliance on informal reminders, which led to inconsistent adherence to essential prevention practices. The quality management team felt that this retrospective approach hindered progress toward CAUTI prevention and contributed to the increased incidence in the local facility.

Formal training programs are the most effective approach to introduce and promote evidence-based best practices for the prevention of infection in acute care facilities (Cherry et al., 2012; Djukic, Kovner, Brewer, Fatehi, & Jun, 2015; Fessele, et al., 2014; Finan, 2012; Finney et al., 2016; Justus, Wilfong, & Daniel, 2016; Mathur et al., 2015; Woolforde & Castro, 2013). Specifically, nurse-driven training programs heighten staff awareness of infection prevention practices and reduce the incidence of nosocomial infections (Bernard et al., 2012; Davis & Knowlden, 2016; Fink et al., 2012; Galeon & Romero, 2014; Knudson, 2014; Mori, 2014; Navoa-Ng et al., 2013; Parry, Grant & Sestovic, 2013; Underwood, 2015; Woolforde & Castro, 2013). Further, advancements in technology and research have improved nursing education, knowledge, and practice specific to CAUTI prevention strategies, and these efforts have been positively correlated with a decrease in the number of catheter days and risk for infection (ANA, 2016; Esche, Warren, Woods, Jesada, & Iliuta, 2015; Knudson, 2014; Leone, 2012; Persson, Dalholm, Wallergard, Johansson, 2014; Umer, 2016). A review of the literature also revealed that while most nurses recognize the value of utilizing evidence-

based practice to improve the care of their patients, they may have limited access to current, evidence-based information and educational opportunities (Al-Hussami & Darawad, 2013; Melnyk, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012). For these reasons, the local facility implemented a nurse-driven, evidence-based CAUTI prevention training program. Mandatory participation in the program designates a set amount of time, at least annually, for nurses to submerge themselves in current, evidence-based strategies to prevent these infections, thereby filling the gap-in-practice identified in the current literature. The QI initiative was recently implemented in the local facility, and evaluation of that pilot project was the focus of the DNP project.

Local Background and Context

Part of a larger, privately owned health system, the local facility is an acute-care, inpatient facility located in a metropolitan area. The mission and strategic vision of the organization are focused on providing exceptional, world-class care in a cost-effective manner to the community it serves. Nosocomial infections reflect a lower quality of patient care, drive up the cost of care, causes patient harm and suffering, and results in poor patient outcomes, all of which directly contradict the mission and strategic vision of the organization (Bernard et al., 2012; IHI, 2017). CAUTI are infections of the urinary tract caused by an indwelling urinary catheter, a tube inserted directly into the bladder to drain urine (CDC, 2015; United States National Library of Medicine, 2016). Over the 2 years preceding project implementation, the incidence of these nosocomial infections had increased by 15% in the local facility. Organizational leaders discussed that the root-cause-analysis process, a team approach utilized to identify the cause of a failure or

problem to improve patient safety and outcomes, revealed poor staff utilization of current, evidence-based practices to prevent these costly nosocomial infections in the local facility (USDVA, 2015). Evidence-based practice is the utilization of the current, best available evidence to inform patient care (Rosser, 2015). Feedback provided by the nursing staff to the facility's leadership team revealed a knowledge deficit, which was subsequently linked to insufficient formal training on evidence-based CAUTI prevention principles. In similar organizations, formal, nurse-driven, evidence-based, CAUTI prevention training programs have increased staff adherence to preventive measures, reduced the number of infections, decreased the length of stay, reduced organizational costs, and facilitated better outcomes for patients requiring an in-dwelling urinary catheter during their inpatient stay (Davis & Knowlden, 2016; Galeon & Romero, 2014; Jones, Sibai, Battjes, & Fakih, 2016; Knudson, 2014; Mori, 2014). For this reason, the local facility implemented such a program as a small-scale QI project on the two nursing units with the highest incidence of CAUTI in the facility. The purpose of the DNP project was to evaluate that pilot project based on the following clinical question: In acute care in-patient facilities, does CAUTI prevention staff training reduce the incidence of CAUTI, length of stay, and cost to the organization?

Infection control leaders explained that data related to nosocomial CAUTI is reported to state, federal, and private regulatory agencies such as CMS, TJC, and the National Health care Safety Network. These nosocomial infections have been directly linked to substandard patient care, and expenses associated with their treatment are no longer reimbursed by CMS and other third-party payers, thereby creating a substantial

financial burden to the local organization (James et al., 2012; Palmer et al., 2013; Zimlichman et al., 2013). The organization promises patients and families a commitment to quality care by reducing harm and improving outcomes through quality improvement initiatives. Successful implementation of the QI project helps the organization fulfill this commitment while also meeting the mission and strategic vision of providing exceptional, world-class care to the community it serves in a cost-effective manner (Gray et al., 2016). Evaluating the efficacy of the selected intervention in the local facility among the targeted population is an essential component of any QI project, and this was the focus of the DNP project (White et al., 2016).

Role of the DNP Student

As a nurse leader, I serve on multiple committees focused on improving the quality of nursing care and patient safety within the facility. My main goal is to ensure the provision of safe, effective, high-quality nursing care to the patients and communities we serve. This includes equipping nursing staff with the training, education, and tools necessary to succeed in providing that care. My leadership role in the organization provides me with a unique opportunity to affect organizational change at the highest level, even as a DNP student. According to the American Association of Colleges of Nursing (2006), the DNP-prepared nurse creates transformational change through policy development, research, teaching, learning, and experimentation. The DNP project supported the advancement of nursing knowledge, improving the quality of patient care through nursing education and quality improvement initiatives, and will add to the body of existing literature through dissemination.

Motivated by a strong desire to enhance nursing knowledge and lead initiatives that will improve the quality of care delivered in the organization, working closely with the project team, I lead the evaluation phase of the project. Upon completion of that phase, I presented the findings to the project team, along with my recommendations for potential changes in the process and facility-wide implementation based on those findings. Since I have worked as a nurse leader in a variety of environments, there is a potential inherent bias to assume the findings represent a comprehensive solution to the identified practice problem. That potential bias was reduced by working only with the data provided by the project team to assess the true impact of the project and make recommendations for improvements prior to organization-wide implementation.

Role of the Project Team

The project team was comprised of the directors of quality management, nursing education, and infection control, as well as the managers of the two nursing units included in the pilot project in the local facility. Upon receipt of Walden University IRB approval and final approval of the proposal by the DNP capstone project committee, the author joined the project team to lead the evaluation efforts. Project evaluation focused on the impact of the QI initiative on the incidence of CAUTI and its associated length of patient stay and cost to the organization on the two nursing units included in the pilot project. These de-identified, auto-generated data points were provided to the author on a monthly basis by the directors of quality management and infection control and were recorded and tracked on an excel spreadsheet every 30 days for 90 days

postimplementation. Totals for each data point in the quarter postimplementation were placed in a simple, quarterly bar chart (see Figure 1) for comparison to preimplementation data to determine if the intended outcomes of the project were met. Within 30 days of final data collection, the author presented the findings to the project team, along with recommendations for potential changes in the process and facility-wide implementation based on those findings. These findings and recommendations were presented in a PowerPoint presentation that included easy-to-understand charts and graphics, and a copy of the presentation was distributed to each project team member.

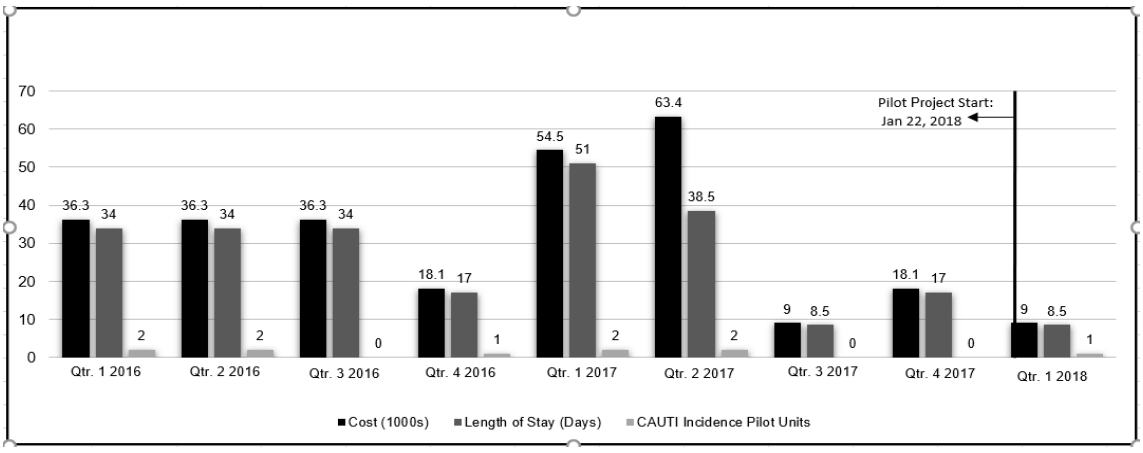

Figure 1. CAUTI incidence, length of stay, and cost, pre- and postimplementation. This figure illustrates these data points on the pilot units before and after the QI pilot project.

Summary

Linked to a nursing knowledge deficit, and subsequently attributed to a lack of formal introduction to preventive principles, the local facility leadership team recognized an increased incidence of nosocomial CAUTI in the 2 years preceding project implementation. Using Lewin's Theory of Planned Change and the Iowa Model of Evidence-Based Practice Change, an evidence-based, CAUTI prevention training program was piloted on the two nursing units in the facility with the highest incidence of these infections. Implemented as a QI initiative, main goals of the project were to reduce the incidence of CAUTI and decrease the associated length of stay and cost to the organization. Utilizing de-identified, auto-generated data provided by the directors of quality management and infection control, these variables were tracked monthly on an Excel spreadsheet. Totals for each of these data points for the 90 days postimplementation were placed in a quarterly bar chart and compared to quarterly data for the 2 years preceding implementation to determine if the intended outcomes of the project were met. These methods are more detailed in the next section.

Section 3: Collection and Analysis of Evidence

Introduction

Accounting for nearly half of nosocomial infections in health care facilities in the United States, CAUTI increases morbidity and mortality, lengths of patient stay, and expenses for organizations (Fink et al., 2012; IHI, 2017). Per facility finance and quality leadership, the local facility experienced a sharp increase in the incidence of these infections in the 2 years preceding project implementation and linked this increase to a nursing knowledge deficit related to simple prevention principles. Attributing the deficit to the lack of formal training opportunities, organizational leaders sought to address it by implementing an evidence-based, CAUTI prevention training program as a QI initiative. Based on Lewin's (1947) theory of planned change and the Iowa Model of Evidence-Based Practice Change (Titler et al., 2001), the initiative was piloted on the two nursing units with the highest incidence of these infections in the local facility.

The purpose of the DNP project was to evaluate the pilot project's efficacy in reducing the incidence of CAUTI, as well as its associated length of patient stay and expense to the organization by analyzing de-identified, pre- and postimplementation, archival, and operational data provided by the facility's director of quality management. These findings, along with recommendations for potential changes prior to facility-wide implementation, will be provided to the project team.

Section 3 is focused on collection and analysis of the evidence I used to answer the clinical question. I will also explore the relationship between the local problem, gap-in-practice, and the practice-focused question. Sources of evidence that were utilized to

address that question will be discussed, and operational definitions related to key aspects of the DNP project will be clarified. The section also includes details on the specific methods used for data collection and analysis, as well as the procedures that were utilized to organize and protect the data.

Practice-Focused Question

In the 2 years preceding project implementation, organizational leaders recognized that the incidence of CAUTI had increased by 15% in the local acute care, inpatient facility. Nosocomial CAUTI is an infection of the urinary tract caused by the insertion of a catheter into the bladder to drain and collect urine (CDC, 2015). According to the facility's finance team, treatment of nosocomial CAUTI has increased the length of stay for affected patients and driven up cost to the local facility, as these expenses are not reimbursed by third party payers (CDC, 2015; United States Library of Medicine, 2016). Organizational leaders share that chart reviews and subsequent root-cause analyses, a team approach to identifying the underlying cause of a failure or problem (Scanlon, Wells, Wollforde, Khameraj, & Baumgarten, 2017), revealed poor nurse compliance with evidence-based, CAUTI prevention principles (USDVA, 2015). Feedback from the unit nurses suggested a knowledge deficit related to those principles, and organizational leadership concluded that failure to formally introduce the principles to the staff was the gap-in-practice causing the clinical practice problem. That conclusion prompted the following practice-focused question: In acute care in-patient facilities, does CAUTI prevention staff training reduce the incidence of CAUTI, length of stay, and cost to the organization?

Staff prevention training is essential to reducing the incidence of nosocomial infections in health care facilities (Cherry et al., 2012; Flodgren et al., 2013; Ho et al., 2012). In an effort to bridge the identified gap-in-practice and solve the clinical practice problem, leaders of the local facility piloted a CAUTI prevention training program as a QI initiative on the 2 nursing units with the highest incidence of infection in the facility. Since evaluation is essential to ensuring the intended outcomes are met (White et al., 2016), the purpose of the DNP project was to evaluate the pilot project's efficacy in reducing the incidence of CAUTI and its associated length of patient stay and organizational expenses.

Sources of Evidence

The main goals of the QI project were reducing the incidence of nosocomial CAUTI and its associated length of patient stay and cost to the organization. Evaluation of that initiative was the focus of the DNP project; therefore, I conducted an extensive review of the current scholarly literature focused on identifying methods to adequately evaluate the QI initiative to ensure the intended outcomes were met (Melnyk & Fineout-Overholt, 2015; Peterson et al., 2014). EBSCO, CINAHL, National Guideline Clearinghouse, Cochrane Library, and Ovid were the most appropriate databases to search for scholarly literature to support the DNP project (Strouse, 2015; Terri, 2015). Derived from the clinical question, I used key search terms and Boolean phrases to search these databases for clinical practice guidelines, peer-reviewed journal articles, and systematic reviews published within the past 5 years (Peterson et al., 2014). In search of statistical data, I reviewed white papers, evidence-based guidelines, and relevant

professional and regulatory websites, including the CDC, IOM, AHRQ, TJC, WHO, APIC, SHEA, SUNA, and ANA.

Information derived from the literature review provided insight on the historical background and significance of CAUTI, evidence-based interventions to address it, and evidence-based methods to evaluate the efficacy of the selected intervention in reducing its incidence (Melnyk & Fineout-Overholt, 2015; Peterson et al., 2014; Strouse, 2015). Focused on enriching nursing practice through evaluation, I used Taylor and Proctor's (2009) critical appraisal process reduce bias and meet the objectives of the literature review. The strength and relevance of the evidence were evaluated and categorized utilizing the ANCCN's evidence-based rating system (Armola et al., 2009; Peterson et al., 2014). Pre- and postimplementation, archival and operational data were de-identified and provided to me for analysis by the facility's director of quality management for the purpose of the DNP project. I used this data to evaluate the efficacy of the pilot project in the facility by assessing its impact on the incidence of CAUTI and its associated length of stay and organizational expenses.

Archival and Operational Data

Nosocomial CAUTI are reported to and investigated by the quality management department in the local facility. Patient charts are reviewed by quality management staff through the Meditek clinical documentation system, and patient accounts are also reviewed to investigate length of patient stay and cost to the organization for each infection. The quality management staff adds that information obtained from the clinical documentation system can only be modified by the clinician entering the information;

data collectors are only able to review information). According to the director of quality, this process maintains integrity of the data entry and collection processes to ensure validity of the data extracted. Data obtained from these reviews are entered into a database and tracked by quality management personnel. The quality department considers these records primary sources of information, the sole source of data related to nosocomial infections acquired in the facility; therefore, these data are considered valid, reliable, and the best source of information related to nosocomial CAUTI in the facility according to the director of quality.

Decreasing the incidence of CAUTI and its associated length of patient stay and organizational expenses were the intended outcomes of the pilot project. Pre- and postimplementation data pulled from quality management's database were examined to determine if those outcomes were achieved. For privacy purposes, I was not given direct access to the database. Instead, this information was pulled from the database and provided to me by the director of quality management without patient or facility-identifying information. Preimplementation incidence of CAUTI and its associated length of stay and cost to the organization per incident in the 2 years prior to implementation were provided to me by the directors of quality management and infection prevention. These variables were tracked monthly for a total of 3 months on an Excel spreadsheet. Totals for each of the variables for 90 days postimplementation were placed on a quarterly bar chart and compared to quarterly data for the 2 years preceding project implementation to determine if its intended outcomes were met.

Small sample size and my inability to independently verify the information provided by quality management were the only limitations inherent in the data related specifically to CAUTI incidence. Computing the number of patient days and organizational expenses associated with each infection based on an average ascertained from retrospective data created some limitations for these two data points. This approach, however, was the most appropriate, as care of affected patients was likely on-going at the time of data collection since incidence was assessed for the 90-day time-period immediately preceding data collection. Final information related to those data points are not available for analysis for the purpose of the DNP project, and incomplete data would create significant limitations and render inaccurate results.

Analysis and Synthesis

The focus of the DNP project was to evaluate the QI initiative recently implemented in the local facility to determine if the intended project outcomes were met. Reducing the incidence of CAUTI and its associated length of stay and organizational expenses were the main goals of the pilot project. Pre-and postimplementation mean length of stay, expense to the organization, and CAUTI incidence were provided by the directors of quality management and infection control, and these pre- and postimplementation data points were compared and analyzed to evaluate the impact of the QI pilot initiative. CAUTI incidence, length of stay, and cost were tracked monthly on an excel spreadsheet for a total of 90 days. Totals for each of these data points were placed on a quarterly bar chart and compared to quarterly data for the 2 years preceding implementation to determine if the intended project outcomes were met. This

determination was made based on a one-sample t-test of the incidence of CAUTI with a 95% confidence level. A visual representation of the pre- and postimplementation data points was presented in the final project in chart format as Figure 1.

Computation of project variables based on a retrospective mean incidence of CAUTI creates limitations of these two data points. Further, retrospective financial data did not account for inflation, and created another limitation of the data. Despite these limitations, this approach was the most appropriate since care of affected patients was likely on-going at the time of data collection and incidence was assessed only for the 90-day time-period immediately preceding data collection. Because of this, final information to support those data points was not available, and incomplete data created significant limitations and rendered inaccurate results.

Summary

In response to the increased incidence of CAUTI in the local facility, a QI initiative to address this practice problem was recently piloted on the two nursing units with the highest incidence in the 2 years preceding the project. The purpose of the DNP project was to evaluate the efficacy of the initiative in meeting its main goals to reduce CAUTI incidence, as well as its associated length of patient stay and organizational expenses. I conducted a rigorous review of current, scholarly literature to support the pilot project's methods and to adequately evaluate the project's efficacy in addressing the practice problem (Melnyk & Fineout-Overholt, 2015; Peterson et al., 2014). Utilizing de-identified, auto-generated data provided by the quality management and infection control directors, the project variables were tracked monthly on an Excel spreadsheet. Totals for

each of these data points for 90 days postimplementation were placed on a quarterly bar chart and compared to quarterly data for the 2 years before QI project implementation. These data points were analyzed to determine if the project was effective in reducing the incidence of CAUTI and its associated length of patient stay and expense to the organization on the pilot units.

The DNP project was implemented upon receipt of final DNP project committee and Walden University IRB approval. Project findings, as well as their implications and limitations, are discussed in section 4. Recommendations based on those findings outlined in the net section, along with potential implications for positive social change, contributions of the project team, and strengths and limitations of the project findings.

Section 4: Findings and Recommendations

Introduction

In 2013, leaders of the local acute care facility implemented several evidence-based, CAUTI prevention initiatives in an effort to improve the quality of patient care and safety and reducing morbidity, mortality, and the financial impact of pay for performance initiatives developed by CMS and other insurers. Despite these efforts, in the 2 years prior to project implementation, the incidence of CAUTI increased by 15%, according to facility leadership. The facility's finance leaders shared that in 2016, patients who were diagnosed with CAUTI at the acute care facility exceeded their expected length of stay by 119 days, with a cumulative cost of almost $140,000, which is an average of approximately $9,000 per incident. After obtaining feedback from the nursing staff and carefully analyzing all related data, facility leadership determined insufficient CAUTI prevention education for the nursing staff was the gap-in-practice that ultimately led to staff nonadherence to evidence-based prevention principles and the subsequent increased incidence of these infections. In order to bridge this gap in practice, nursing leaders and staff at the site facility piloted an evidence-based, CAUTI prevention education program for the nursing staff as a QI initiative on the two units with the highest incidence of these infections in the facility. The purpose of this DNP project was to evaluate that pilot project to determine its efficacy in reducing the incidence of CAUTI, length of stay, and health care cost.

In conducting a comprehensive scholarly literature review prior to the project proposal, I gained more understanding of the historical background and significance of

CAUTI, evidence-based interventions to reduce its incidence, and potential evidence-based methods to facilitate high-quality evaluation of the selected intervention (see Melnyk & Fineout-Overholt, 2015; Peterson et al., 2014; Strouse, 2015). Taylor and Proctor's (2009) method was used to critically appraise evidence and reduce bias, thereby improving nursing practice through the evaluation of literature. The ANCCN's evidence-based rating system was used to categorize and evaluate the strength and relevance of the evidence to support the project (Armola et al., 2009; Peterson et al., 2014). De-identified, archival and operational data were provided by the quality management department to support the need for project implementation in the local facility. These data were also used to evaluate the efficacy of the QI initiative by assessing its impact on CAUTI incidence and its associated length of stay and expense to the organization. The mean incidence of CAUTI, as well as its associated number of patient days and cost to the organization, for the 2 years preceding project implementation and the 90 days postimplementation were used to evaluate the efficacy of the QI initiative. Each of these de-identified data points was provided by the directors of quality management and infection control every 30 days for a total of 90 days postimplementation. I analyzed the data using a one-sample t-test with a 95% confidence level.

Findings and Implications

The purpose of the DNP project was to evaluate the impact of a QI pilot project focused on providing CAUTI prevention education to the nursing staff in the local facility. Reducing the incidence of CAUTI and its associated length of patient stay and cost to the organization were the main goals of the pilot project. Data points for the 2

years preceding project implementation and 90 days postimplementation were analyzed and compared to evaluate the impact of the pilot project (see Figure 1). Using preimplementation data provided by quality staff, a one-sample t-test with a 95% confidence interval revealed an average of 1.12 CAUTI per quarter on the two pilot units for the 2 years preceding project implementation ($\mu = 1.12 \pm 0.99$). In the 90 days postimplementation, there was one incidence of CAUTI between the two pilot units, suggesting a nonsignificant difference ($p = .732$) in CAUTI incidence postimplementation when compared to preimplementation data provided by quality staff. Postimplementation incidence of CAUTI was utilized to calculate length of stay and cost of the CAUTI that occurred postimplementation based on retrospective, preimplementation mean length of stay and mean cost per CAUTI. Finance staff shared that the preimplementation mean length of stay associated with a single incident of CAUTI was 8.5 days with an average cost to the organization of $9,000 per incident. Considering the mean incidence of CAUTI preimplementation ($\mu = 1.12 \pm 0.99$) and postimplementation incidence (one), postimplementation length of stay was 8.5 days at an estimated total cost of $9,000 to the organization, compared to a preimplementation length of stay ranging from 1.1 to 17.9 days and costs ranging from $1,170 to $18,990. These findings are not statistically significant. Thus, based on the data 90 days postimplementation, the QI pilot project did not significantly reduce the incidence of CAUTI and its associated patient days and cost to the organization.

Evaluation of the QI project recently implemented at the site facility suggested the implementation of an evidence-based CAUTI prevention education for nursing staff did

not significantly reduce the incidence of CAUTI, nor its associated length of stay and cost to the organization. This unanticipated outcome is directly related to the project's greatest limitation, which is time to adequately assess the impact of the initiative postimplementation. Only 90 days of postimplementation data were available for analysis, rendering very little data to truly assess the impact of such a project. Successful evidenced-based practice projects related to CAUTI reduction typically involve an evaluation period of at least 12-18 months before a positive reduction in morbidity, mortality, and overall cost of care can be appreciated; therefore, additional time to analyze the results is needed to adequately assess the impact of the QI project (Flodgren et al., 2013; Ho et al., 2012). Collecting and analyzing additional data may support a statistically significant change in project outcomes, providing implications for positive social change by reducing the burden of these infections on patients and the overall cost of health care (Gray et al. 2016; Justus et al., 2016; Koo et al., 2016; Parry et. al, 2013; Umer et al., 2016).

Recommendations

Facility leadership and staff participated in a root-cause analysis of the CAUTI reported in the immediate 90-day postimplementation period and identified practice gaps such as inadequate peri care and improper use of incontinent pads by unlicensed nursing staff. Leaders and staff therefore concluded that the infection was likely linked to those gaps in practice. Based on this conclusion, I recommended that the project team provides additional initial and annual training on proper peri care and use of incontinence pads for non-licensed nursing staff. Specifically, after completing the online modules, unlicensed

nursing staff would attend a regularly scheduled, hands-on in-service requiring participants to provide return demonstrations and validate competency using case-based scenarios to ensure staff are performing these practices in a competent manner (Bernard et al., 2012; Cherry et al., 2012; Finan, 2012; Finney et al., 2016.

The Iowa Model of Evidence-Based Practice Change was used to implement and evaluate the QI pilot project in the local facility, and in accordance with that model, an evaluation of that project was undertaken to determine if the practice should be implemented facility-wide or if other practice changes should be considered (Lewin, 1947; Petiprin, 2016; Titler et al., 2001). Only 90 days of postimplementation data was available for the purpose of that evaluation, and analysis of that data revealed implementation of an evidence-based CAUTI prevention education initiative for nursing staff was not statistically significant ($p = .732$) in reducing the incidence of CAUTI and its associated length of stay and cost of care to the organization. Similar QI projects implemented to address the incidence of CAUTI have failed to demonstrate sustainable, positive change prior to 12-18 months postimplementation (Flodgren et al., 2013; Ho et al., 2012); therefore, it is recommended that conclusions related to the efficacy of this and similar initiatives, as well as decisions related to facility and organization-wide implementation not be made until a minimum of 12-18 months of postimplementation data is available for analysis. I also recommended a monthly evaluation by the project team to assess for any potential changes to the project plan that would facilitate successful attainment of project goals (Scanlon et al., 2017; Titler et al., 2001).

Contributions of the Doctoral Project Team

The purpose of the DNP project was to evaluate a QI pilot project recently implemented on two nursing units in an inpatient, acute care facility. Assessing the impact of an evidence-based CAUTI prevention education program for nursing staff on the incidence of CAUTI and its associated length of stay and cost of care was the main focus of the project. Working with the project team was important to the planning, implementation, and proper evaluation of the project. Team members included the directors of quality management, nursing education, and infection control, finance department staff, and the nurse managers of the two pilot units in the local facility. The directors of quality management, infection control, and finance helped the team understand the problem, as well as its impact on patient outcomes and the financial impact on the facility. Feedback from front-line staff and their nursing leadership was essential to identifying the gap-in-practice largely contributing to the clinical problem, while nursing education offered evidence-based strategies to best address the lack of knowledge related to CAUTI prevention in the facility. Postimplementation, the project team met on a monthly basis, and the director of infection control provided the number of CAUTI on the two pilot units in the preceding 30 days. During the implementation phase, the director of nursing education was responsible for deploying the electronic education modules and tracking staff completion, while nurse managers on the pilot units were responsible for providing opportunities for the staff to complete the modules within the delegated 2-week time-frame.

Postimplementation, the director of infection control at the facility provided me with the number of CAUTI on the two pilot units every 30 days for a total of 90 days. Root-cause analysis meetings were held within 14 days of identifying a CAUTI on either of the two pilot units, and the project team would utilize all data available to determine the root-cause of the infection, which was also noted and tracked by the writer. I presented the incidence of CAUTI and its associated length of stay and cost to the organization for the 90 days postimplementation in PowerPoint format to the project team. The project team and I discussed options moving forward, including possible adjustments to the project plan. Based on the information available 90 days postimplementation, as well as the feedback provided by pilot unit staff to their nurse managers, the decision was made by the project team to incorporate an additional, hands-on component for unlicensed nursing personnel. Further, according to the current, scholarly literature, the impact of similar QI projects could not adequately be assessed until 12-18 months postimplementation (Flodgren et al., 2013; Ho et al., 2012; Parry et al., 2013); therefore, the project team agreed to extend the pilot project beyond 90 days and will evaluate progress on a monthly basis for one year to ensure recommendations for facility-wide implementation are based on a sufficient amount of outcomes data.

Strengths and Limitations of the Project

Strengths of this project include the implementation of current, evidence-based principles to solve a clinical problem, a robust critical appraisal process, and team engagement. The intense critical appraisal process included a review of the current, scholarly literature that was subsequently organized into a matrix, and each article was

rated based on strength of the evidence. Taylor and Proctor's (2009) process of analysis was utilized to reduce bias and ensure the literature was relevant to the project and based on current evidence (Armola et al., 2009; Cherry et al., 2012). Project team members were extremely involved in the planning, development, implementation, and evaluation phases of the project. All members provided valuable information and feedback and worked in a cohesive and supportive manner to maximize the impact of the project.

The greatest limitation was the limited amount of data available for analysis, which was directly related to the availability of only 90 days postimplementation data. Similar initiatives, particularly those addressing the incidence of CAUTI, have failed to demonstrate sustainable, positive change prior to 12-18 months postimplementation (Flodgren et al., 2013; Ho et al., 2012). Therefore, the project team recommends an additional 12-18 months of postimplementation data collection to facilitate an adequate and complete evaluation of such an effort (Parry et al., 2013). Another limitation was the utilization of retrospective data to calculate the organizational cost and length of stay associated with each CAUTI postimplementation. According to Schelling et al. (2015), retrospective data does not account for inflation, and lengths of stay can widely vary. Utilizing more than 90 days of postimplementation data would resolve the need to use retrospective data to calculate length of stay and cost data points (Parry et al., 2013), thereby eliminating this limitation prior to final pilot project evaluation.

Section 5: Dissemination Plan

Plan for Dissemination

The project team met 10 days after completion of the 90-day pilot project. I presented the findings and recommendations to the team using a PowerPoint presentation that included charts and graphics that were designed to be easy to understand. Based on project findings, the project team made the decision to extend the pilot project to 12 months and add additional training for nonlicensed personnel. I subsequently presented project findings and recommendations to executive-level leadership in the local facility, who approved the recommendations. Project findings and the approved recommendations will be disseminated to nursing staff on the pilot units by their nurse managers between October and November 2018.

The most valuable lesson I learned from the DNP project, which should be widely disseminated to nurses and nurse leaders, is to allow sufficient time for adequate evaluation of QI projects (see Parry et al., 2013). This message should be broadly shared with members of the nursing profession through written publication in scholarly nursing journals, as well as lectures and poster presentations at professional conferences at the local, state, and national levels. The final project paper was submitted to ProQuest for publication; however, additional submission to the *American Journal of Nursing* or the *American Journal of Infection Control* will facilitate global dissemination of project findings and recommendations, if selected for publication.

Analysis of Self

Serving as manager of the project, I was given an opportunity to closely examine the intricacies of clinical problems faced by those providing hands-on patient care and developing reasonable, evidence-based solutions to those problems through a collaborative process with nursing and non-nursing personnel. As the project manager, I was actively involved in evaluating those efforts, which gave me with a clear view of the impact of such initiatives on patients, their families, and the nursing staff providing direct care to them. Though not statistically significant, the project demonstrated some promise based on the outcomes data derived 90 days postimplementation. The availability of only 90 days of postimplementation data created a serious limitation but offered insight to the importance of planning for longer evaluation periods of such efforts. Evaluation of the project for a longer period should provide more insight about its efficacy in reducing negative outcomes and promoting patient safety and high-quality care.

I did experience some challenges along the way; however, those challenges contributed to my development as a scholar-practitioner. Specifically, in the initial project development stage, I struggled to find theoretical and practice models to support the project. Guidance provided by professors and librarians helped to improve my search for theoretical and practice models that were well connected to the core of the project. I also struggled with writing the capstone project in a scholarly manner; however, I worked hard with my project chair, the Walden Writing Center, my preceptor, and colleagues to improve my writing style.

Patients and their families are extremely important to me, and without them, my role as a nurse would not exist. I believe that as a nurse, I play a vital role in the healing and long-term well-being of those entrusted to my care. As an experienced practitioner, I now spend most of my time as an executive nurse leader examining trends to identify clinical problems and working with other nurse leaders in the organization to identify evidence-based approaches to solve those problems in a fiscally responsible manner. I am a less experienced scholar than practitioner, and this project provided me with an opportunity to parlay my experience as a practitioner and nurse leader to develop and use the skills required of nurse scholars. As a DNP, I plan to continue to develop these skills and use them to not only improve the lives of those I serve, but the lives of patients globally through scholarship, service, and dissemination of those efforts.

Summary

In this DNP project, I examined the impact of prevention education on the incidence of CAUTI and its associated length of stay and cost at an acute care, in-patient facility where leadership determined that the incidence had increased by 15% since 2016. The two units with the highest incidence of CAUTI piloted the QI project. The purpose of the DNP project was to evaluate the impact of the pilot initiative prior to facility-wide implementation. An interdisciplinary project team formed to support the pilot project's development, implementation, and evaluation. Using 2 years of preimplementation data and 90 days postimplementation data, a one sample t-test revealed no significant difference ($p = .732$) in CAUTI incidence postimplementation. I presented these findings to the project team, who subsequently recommended to facility leadership that the

evaluation period be extended to 12 full months to allow for adequate evaluation of outcomes data on the pilot units prior to rendering a final recommendation on facility-wide implementation. Sufficient data are essential to proper evaluation of QI initiatives; therefore, organizations should allow for a 12-18-month evaluation period prior to drawing any conclusions or offering any recommendations related to similar pilot initiatives (Parry et al., 2013). In conclusion, the project team plans to continue gathering outcome data to assess the impact of the pilot project as it relates to the practice question, given an extended evaluation period. This additional time may yield a positive conclusion related to the impact of staff education on CAUTI prevention, length of stay, and cost.

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