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The Effects of Nursing Education on Decreasing Catheter Associated Urinary Tract Infection Rates

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This is to certify that the doctoral study by

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Abstract

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MSN, Rutgers State University of New Jersey, 2004

BSN, College of New Rochelle, 2000

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Project Submitted in Partial Fulfillment

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Abstract

Catheter-associated urinary tract infections (CAUTIs) account for 40% of all nosocomial infections in the United States, affecting nearly 900,000 patients per year. The indwelling urinary catheter (IUC) is a widely utilized device in modern hospital environments, yet they are not always used appropriately in hospital settings and can result in prolonged use and improper management, increasing risk of infections and length of stay. Nurses are the primary champions to promote preventative measures, provide patient education, and evaluate evidence-based practice (EBP) strategies to decrease CAUTIs. The purpose of this study was to determine if nursing education on EBP guidelines could decrease CAUTI rates in hospitalized patients on a medical surgical unit. A quasi-experimental, one group, before-and-after design was used to evaluate changes in CAUTI rates before and after the educational intervention in a hospital in the southeastern United States among staff of 63 nurses. The baseline unidentified CAUTI rate of the selected population was provided by the organization prior to the educational intervention. There were 55 nurses who attended the educational session and the post-CAUTI rate was evaluated 1 month after the educational intervention. At the end of the study period, analysis of CAUTI rates were conducted using a chi square test to evaluate whether there was a significant difference in the CAUTI rates. A statistically significant difference was found in the pre-to post-CAUTI rate ($p < 0.05$). The results of this study demonstrated that educating nurses on the CDC- recommended EBP guidelines and providing them with leadership supports significantly decreased CAUTI rates on a medical surgical unit. These findings suggest that using an effective approach to decrease CAUTI rates can create social change and initiate additional planning strategies for all healthcare settings.

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Section 1: Nature of the Project

Introduction

Indwelling urinary catheters (IUC) have been used in the healthcare industry since the 19th century for treating both women and men of all ages (Carr, 2000). These catheters are used to manage urinary incontinence and retention, reducing postoperative bladder dysfunction related to anesthesia, surgery, and immobility (Wald, Ma, Bratzler, & Kramer, 2008). According to Wald et al. (2008), IUCs are frequently used to measure accurate urinary output in critically ill patients and patients with severe skin problems who experience full thickness wound and pressure ulcers. In addition, IUCs are used with patients with multiple sclerosis and spinal cord injuries as well as patients who receive large-volume infusions or diuretics during surgery and improvement comforts for end of life care.

IUCs are the leading cause of nosocomial infections in medical and surgical patients in the United States (Saint et al., 2013). Patients' risk of acquiring a CAUTI increases with extended usage and inappropriate insertion and maintenance (Saint, Kaufman, Thompson, Rogers, & Chenoweth, 2005). CAUTI best practice guidelines have been designed to serve as a concise resource for healthcare providers. These guidelines offer a framework to prioritize how often medical professionals should use IUCs while also directing proper application and maintenance of the device, thereby decreasing CAUTI rates.

The Centers for Disease Control and Prevention (CDC) along with the National Healthcare Safety Network (NHSN), a surveillance system of the CDC, provide strict guidelines designed to decrease CAUTI rates. These guidelines include usage in patients

undergoing perioperative surgeries for selected procedures, patients undergoing urologic surgery, patients receiving large-volume infusions or diuretics during surgery, patients with urinary incontinence, and patients during intraoperative monitoring of urinary output (CDC, 2010). In addition, these guidelines describe frequent monitoring of urine output in critically ill patients, managing acute urinary retention/obstruction, facilitating healing of advanced pressure ulcers in incontinent patients, and improving comfort in terminally ill patients (CDC, 2010). According to Saint et al. (2005), IUCs should not be used as a substitute for nursing care of patients with incontinence as a means of obtaining urine for culture or other diagnostic tests. Studies have shown that one of the most effective ways to avoid CAUTIs is to remove unnecessary catheterization and educate patients and nursing staff (Saint et al., 2005).

Background

Healthcare-associated infections (HAIs) have been around for many years and are considered to be preventable infections that patients can acquire while in hospital settings receiving care and treatments for other conditions (Schneider, 2012). According to the CDC, HAIs are one of the top leading causes of morbidity and mortality in the United States (Klevens et al., 2007). Although the estimates are staggering with 1.7 million infections reported amongst patients annually, control of HAIs is now one of the top priorities within the healthcare system (Klevens et al., 2007). Most healthcare organizations have not focused on the frequency of CAUTIs, yet in a national study by Klevens et al. (2007), urinary tract infections (UTIs) comprised 36% of all HAIs. Saint (2000) stated that out of the millions of patients who are admitted into the hospital each

year, at least 25% of them will receive an IUC, of which more than 17% of nosocomial bacteremia infections are attributed to CAUTIs.

Additionally, HAIs have been linked to significant morbidity, with UTIs accounting for more than 30% of HAIs reported, comprising an estimated 560,000 infections (Klevens et al., 2007). Nearly 80% of UTIs in hospital settings are estimated to be catheter-associated, leading to longer lengths of stay as well as being the leading cause of secondary bloodstream infections (Klevens et al., 2007). The continued use of antibiotics to treat UTIs without symptoms contributes to antibiotic resistance, encouraging the development of clostridium difficile infection (Klevens et al., 2007). According to Klevens et al. (2007), it is estimated that 13,000 deaths, with a mortality rate of 2.3%, are attributed to UTIs annually in the United States. Further investigation by Rogers et al. (2008) identified that the mortality rate increases to approximately 10% when patients incur a secondary bloodstream infection as a result of the CAUTI.

The healthcare industry incurs high overhead due to factors including the cost of diagnosis, increased length of stay, and loss of Centers for Medicare and Medicaid Service (CMS) reimbursements (Klevens et al., 2007). These costs are primarily associated with diagnosis and treatment that encompass microbiology studies, labs, diagnostic tests, medications, and intravenous supplies, ultimately decreasing fiscal year revenues (Klevens et al., 2007). The estimated cost of HAIs is $750–$1,000 per infection with an annual cost of $340 to $450 million in the United States, and the cost continues to rise (Klevens et. al., 2007).

In 2008, CMS added CAUTI to the never events list, recognizing it as a patient safety issue that can be avoided in many cases (CMS, 2010). The non-reimbursement of

these funds will have a financial impact on patient care, staff development, and future research initiatives (Rogers et al., 2008). The CDC defined HAIs as the result of pathogens acquired by the patient during hospitalization that were not present at the time of admission (Klevens et al., 2007). McKibben et al. (2005) estimated that each day a patient is hospitalized; there is a 3–7% chance that the patient will acquire a CAUTI. The U.S. Department of Health and Human Services Action Plan to prevent HAIs calls for a 25% reduction in the number of symptomatic CAUTIs per 1,000 urinary catheter-days in the hospital as a national prevention target (Fakih et al., 2012). In January 2012, CMS began requiring acute care hospitals participating in their Inpatient Prospective Payment System (IPPS) to report CAUTIs in adult and pediatric intensive care units (Fakih et al., 2012). During October 2012, CMS also required reporting of CAUTIs throughout inpatient rehabilitation facilities with the proposed data made available for the public at large (CMS, 2010).

Yoon et al. (2013) stated that despite long term placement of IUCs, hospitals are not properly auditing catheterized patients, and providers are not aware that their patients actually have an IUC. Fakih et al. (2008) showed a decrease in CAUTI rates by increasing nurse and physician awareness of the infection. Discussions initiated by Ridenour and Trautman (2009) indicated that nurses have a direct impact on patient safety and care, including the outcomes of best practice initiatives and decision-making. In a review of nursing strategies to decrease CAUTIs, Bernard, Hunter, and Moore (2012) found that nurse-led interventions, systematic monitoring of patients and reminders to physicians of patients with IUCs, assisted in decreasing CAUTI rates. Additionally, the results suggested further research is needed to assess the benefits

targeted at the education of nurses about the effects of IUC cessation (Bernard et al., 2012).

Further, CAUTI research within the healthcare industry will be able to identify strengths and weaknesses of evidence-based practice (EBP) guidelines (Lo et al., 2008). As a result, focusing on the strengths of EBP guidelines will increase patient safety and produce positive outcomes (Lo et al., 2008). Efficiency and effectiveness are the most skillful models of research studies in order to enhance collaboration with stakeholders in identifying the problem leading to the development of hospital-wide awareness (Lo et al., 2008).

Problem Statement

In order to eradicate CAUTIs, one major focus is avoiding catheterization whenever possible (Dailly, 2011). There is valid clinical data of the etiology and clinical indications of CAUTIs as well as EBP guidelines to help prevent and decrease patients from developing CAUTI. Hospitals are forced to address this ongoing issue using creative strategies starting with the frontline staff whose impact can improve the quality of care provided (CMS, 2010). There are limited studies that evaluate the effects of teaching direct education of best practice guidelines to nurses in conjunction with decreasing CAUTI rates among adult medical-surgical units (Schneider, 2012). The pressured demand on organizations to deliver high-quality care to patients intensifies the need to develop EBP (CMS, 2010).

Nurses are the key providers whose role allows for insertion and maintenance of IUCs and producing positive outcomes (Bernard et al., 2012). Several studies have identified the need to assess the necessity of an IUC as well as reducing the duration

usage time. However, because nursing has a key role in patient's outcomes, there is a need to provide them with the evidence -based knowledge needed to advocate for patients and implement best guidelines in their practice. The ultimate goal of nursing research is to develop a body of knowledge to support and advance nursing practices (Reed & Lawrence, 2008), which projects the outcomes of this experiment to add to the body of literature concerning nursing knowledge, assessment, and improving practices through nursing education to decrease CAUTI rates (Crouzet et al., 2007). It is also suggested that CAUTIs best practice guidelines knowledge will empower nurses to challenge IUC usage and inappropriate indications (Crouzet et al., 2007). Moreover, the effectiveness of an educational intervention designed to improve nurses' assessments, knowledge, and IUC practices such as IUC/peri-care, hand hygiene, and management of IUC will provide a solid foundation for future research (Bernard et al., 2012).

Purpose Statement

The purpose of this study was to determine if educating nurses on evidence-based guidelines recommended by the CDC will decrease CAUTI rates on a medical-surgical unit.

Project Objective and Goal

The objective of this study was to assess whether nursing education on CAUTIs EBP guidelines decreases infections among adult medical and surgical patients as shown through a decrease in the number of CAUTI rates. Oman et al. (2012) suggested that there is a gap between EBP in nursing aligned with limited availability and dissemination of current concepts within the nursing population. The goal of this study was to elicit a

change in practice through education while promoting downward trends in the incidence of CAUTIs.

Significance/Relevance to Practice

Today between 15–25% of hospitalized patients receive IUCs during their hospital stay (Cravens & Zweig, 2000). IUCs are known to cause many health problems such as urinary tract or kidney infections, septicemia, urethral injury, skin breakdown, bladder stones, hematuria, and after years of catheter use, bladder cancer can develop with possibility of death (Cravens & Zweig, 2000). The urinary tract has been acknowledged to be the most frequent site of nosocomial infections (Cravens & Zweig, 2000). Acute care hospitals have nationally reported an estimate of 800,000 patients per year acquires a CAUTI and 66–86% of those were due to prolonged catheterization (Apisarnthanarak et al., 2007). While nurses are at the forefront of patient care, physicians are consistently unaware that some of their patients have IUCs (Yoon et al., 2013). Further training and education of nursing professionals can help alleviate and limit the usage of IUCs. Essentially, organizations are able to decrease CAUTI rates by initiating a zero tolerance attitude and increase the quality of care provided by healthcare providers nationally.

As of October 2008, the CMS no longer reimburses hospitals for CAUTIs that could have been prevented (Schneider, 2012). These new guidelines have spurred hospitals to address the challenges needed to decrease or eliminate these unnecessary infections. In a recent survey, Saint (2000) found that no single strategy was widely used across hospitals to prevent these infections. More than 50% of hospitals did not monitor the number of patients who had IUCs or the duration of use (Klevens et al., 2007).

Hospitalized patients are at a higher risk for acquiring UTIs depending on a variety of factors such as gender, age, lifestyle, anatomy, and disease process (Saint, 2000). Yin-Yin et al. (2013) identified that nearly half of all women are at risk for developing UTIs, due to the short length of the female urethra or underlying conditions that increase the risk of urinary obstruction including genetic abnormalities, prostatitis, and kidney stones.

Studies conducted with patients who are unable to maintain basic activities of daily living skills (ADL) such as impaired voiding and incontinence are also at an increased risk of acquiring a UTI (Huang et al., 2004). According to Reilly et al. (2006) the majority of hospital-acquired UTIs are associated with having an IUC, but the risk of acquiring a UTI depended on the method of catheterization, duration of catheter use, the quality of catheter care, and host susceptibility. In the United States alone, there are more than 30 million IUCs inserted annually, with catheterization procedures contributing to at least one million CAUTIs (Klevens et al., 2007). Furthermore, reasoning used for determining if a patient requires a catheter is not evidence-based (Bernard et al., 2012). The insertion and maintenance of IUCs are in the scope and standards of practice for registered nurses. Nurses play an integral role in developing strategies to limit the use of IUCs reducing the incidence of CAUTIs, evaluating the quality of care while also educating patients on the benefits and risks of unnecessary IUCs insertion and maintenance (Huang et al., 2004).

Saint et al. (2013) estimated that the usage of IUCs ranges from 10% in acute care hospitals to another 10% in long-term facilities, yet current data suggest a percentage as high as 25%. The rationales for this increased usage include complexities of care, increased acuity and severity of illness, also decreased staffing levels (Chettle, 2008).

Many studies identified nurses as the frontline staff who contribute to huge impact on patient outcomes. With CAUTI attracting more attention, nurses are being equipped with best practice recommendations, along with the basics of infection prevention and control which are the necessary underpinnings of programs, policies, and protocols that impact HAIs (Trautner & Darouiche, 2004). Therefore, this study is significant to nursing practices by decreasing CAUTIs, pain, and patient length of stay based on EBP approaches. Such changes ultimately increase revenue and CMS reimbursement, creating a patient safety process that empowers staff and patients to participate in their plan of care to prevent CAUTIs.

Project Question

Does nursing education on best practice guidelines for catheter use decrease CAUTI rates in hospitalized patients on a medical surgical unit?

Hypotheses

Nursing education was hypothesized to reduce CAUTI rates. The stated hypothesis for this study was that providing EBP education to nurses about CAUTI will result in a decrease in CAUTI rates.

Null:

H_0: Education will not have a significant effect on reducing CAUTI rates.

Alternative:

H_a: Education will have a significant effect on reducing CAUTI rates.

Evidence-Based Significance of the Project

The Institute of Medicine (IOM, 2011) launched a 2-year EBP initiative along with The Robert Wood Johnson Foundation (RWJF) to show the significance of why nursing professionals hold the power to decrease CAUTI rates and increase positive patient outcomes in the 21st century. The IOM stated that nurses should practice to the fullest extent of their education and training, and aim to achieve the highest levels of education and training, through educational systems that promote academic progression (IOM, 2011). Furthermore, nurses should serve alongside physicians with full partnership in concordance with other healthcare professionals, identifying problems and areas of systematic waste and implementing improvement plans while tracking the efficiency and effectiveness of the intended goals (IOM, 2011). These practices, education, and training will assist in the evaluation of care and education given to nurses and patients and will further decrease the incidence of CAUTIs.

According to Rakih et al. (2008), nurses are able to translate evidence-based knowledge into practice, and nursing interventions are effective in decreasing the prevalence of unnecessary usage of IUC in hospitalized patients. Evidence from Bernard et al. (2012), Huang et al. (2004), and Trautner and Darouiche (2004) showed that nursing education and nurse driven interventions can produce a significant improvement in patient outcomes regarding CAUTIs. Therefore, given the frequency of urinary catheterization in hospitalized patients, all attempts should be made to promote nursing interventions by educating the nursing staff on the recommended best practice guidelines and advocacy for their patient hospital wide (Trautner & Darouiche, 2004). Lastly,

surveillance with compliance to the recommended guidelines would reduce the risk of CAUTIs and assure that nurses are promoting good EBPs (CDC, 2009).

Implication for Social Change

In order to create social change within the environment of acute care settings, a culture change in this setting for IUC insertion must involve a shift in practice (White-Chu, Graves, Godfrey, Bonner, & Sloane, 2009). Nurses' primary commitment to patient care is to stay current on EBPs. EBP in nursing is a framework for approaching patient care, changing practices, and creating new strategies (White-Chu et al., 2009). Essentially, that experience is what drives novice to expert nurses to provide safe, competent care by incorporating best practices (Brenner & Iafrati, 2014). Brenner and Iafrati (2014) explained that nurses are lifelong learners, critical thinkers, and leaders of social change. Increasing nursing knowledge is the core tool needed to guide treatment of patients and to address underlying social problems on an individual and global level (Brenner & Iafrati, 2014). CAUTIs are preventable infections on which nursing practices can directly impact patient outcomes. Patients' health necessities have become more complicated and are linked to the increasing demand for nurses to be competent in skills required to provide high quality care and produce positive outcomes (IOM, 2010).

These competencies include research and EBP, teamwork and collaboration, leadership, and healthcare policy and system improvement along with competencies in specialty areas and settings (IOM, 2010). Nurses are at the forefront of patient care, and their efforts to cultivate and promote EBPs, education, and leadership within their profession will prepare these nursing professionals for the complexities of patient care (IOM, 2010).

Definitions of Terms

In order to clearly understand CAUTI surveillance, there are certain definitions that must be clearly understood. The keywords are listed below. The CDC (2009) defines these terms:

Biofilm: Communities of different types of microorganisms that attach to environmental surfaces, such as medical devices. They enclose themselves in a protective matrix that is highly protective, and are typically far more resistant to antibiotics than free-floating organisms. They develop rapidly and may be found on any surface where moisture and nutrients are present.

Catheter associated urinary tract infection (CAUTI): An infection thatoccurs in a patient who had an indwelling urethral urinary catheter in place within the 48hour period before the onset of the UTI. The NHSN definition of symptomatic CAUTI has the additional indications:

- The patient has a fever of >100.4F; urgency, frequency, dysuria, or suprapubic tenderness.
- A positive urine culture with >100,000 microorganism per cc of urine with no more than two species of microorganism.

Catheter urinary tract infection rates (CAUTI): The incidence of catheter-associated UTI by dividing the number of UTIs by the number of Foley catheter days and multiplying by 1000 (UTIs/1000 Foley days).

Catheter days: A single 24- hour period that the patient has an IUC. Patient catheter days are calculated at the same time each day per nursing unit.

Hospital acquired urinary tract infection: A urinary tract infection that was not present when the patient was admitted to the hospital before the catheter was inserted. In prior years, a hospital acquired infection was previously termed a nosocomial infection.

Incidence of catheter associated urinary tract infections: The occurrence of hospital acquired catheter associated urinary tract infections that are tracked within the acute care facility through event notifications. Catheter associated urinary tract infections developed in the hospital will be tracked only.

Indwelling urinary catheter (IUC): A drainage tube that is inserted into the urinary bladder through the urethra is left in place and is connected to a drainage bag (including leg bags), also called a Foley catheter. This does not include condom or straight in-and-out catheters or nephrostomy tubes or suprapubic catheters unless a Foley catheter is also present. This definition includes indwelling urethral catheters that are used for intermittent or continuous irrigation.

Prevention of catheter associated urinary tract infections: Implementing strategies and using recommended guidelines to stop the occurrences of hospital acquired catheter associated urinary tract infections.

Symptomatic UTI (SUTI): Patient has an IUC in place for more than 2 calendar days, with day of device placement being Day 1, and catheter is in place when all elements of this criterion are first present together and at least one of the following signs and symptoms: Fever (> 38º C), suprapubic tenderness with no other recognized cause, costovertebral angle pain or tenderness with no other recognized cause and a positive urine culture of ≥ 105 CFUs/ml with no more than two species of microorganisms

Urinary tract: A continuous anatomical tract, including the kidneys, ureters, and urethra, involved in the formation and excretion of urine.

Urinary tract infection (UTI): An inflammatory response of the epithelium of the urinary tract to invasion and colonization by a pathogen, usually bacterial species.

Assumptions and Limitations

The assumptions of this project were that all nurses on the selected unit will participate in the study and that EBP guidelines are able to reduce CAUTI rates while at the same time empower nurses to validate the necessity of IUCs. In addition, best practice guidelines were assumed effective in reducing CAUTIs, and leadership support was able to build a stronger collaboration with the physicians to limit and prevent unnecessary insertion of IUCs. Furthermore, other assumptions include the belief that IUCs are necessary for all patients admitted with fluid imbalances, and clinically indicated IUCs will not cause a CAUTI. It is also believed that healthcare organizations will support the delivery of patient safety, research improvement approaches, and organizational readiness.

The research project limitations include mitigating factors that may influence the implementation of the research project. The CAUTI study will take place on one unit that may only provide a snapshot of the overall effectiveness of the education. In addition, the number of CAUTIs on the unit during the initialization of the study may be low, making it difficult to assess the impact of the intervention. In addition, it is assumed that all of the nurses who participated in the study were able to speak and read English language and have the ability to comprehend the curriculum. Furthermore, the selected nursing population of the medical-surgical unit was representative of nursing overall. Therefore,

the curriculum design could be generalized to the entire nursing population. Moreover, there is a limited time frame and screening for variances in surgical procedures, age, and gender. Lastly, the number of patients and nurses in the study on one unit will represent a small percentage of patients that acquire CAUTIs and the number of nurses on that unit.

Scope

The scope of this study included an evaluation of the impact nursing education has on a medical-surgical unit in decreasing CAUTIs rates/1000 catheter days. The research study focused on nurses on one medical surgical unit in a Level 1 trauma hospital in order to validate the outcomes.

Summary

Urinary catheterization is a procedure carried out by both nursing and medical staff to relieve patients suffering from urine retention, incontinence, and a variety of other medical conditions. Healthcare has acknowledged the importance of using an IUC for appropriate indications in both medical and surgical patients that can provide indispensable benefits. Despite the benefits of using an IUC, it comes with serious risk factors when used for extended periods of time and for the wrong reasons. It also contributes to increasing healthcare costs, patient discomfort, morbidity, and even death (Saint, Lipsky, & Goold, 2002).

The long-term use of IUCs can serve as a one-point restraint device, which in some cases is being used inappropriately. In one study, Jain, Parada, David, and Smith (1995) found that the initial insertion of an IUC was unjustified in 21% of hospitalized patients, and continuous use of the IUCs was unwarranted in nearly half of those patients. Healthcare must address the issues of usage and appropriate indication. In addition,

healthcare organizations must ensure that only properly trained nursing staff who are qualified to perform the skills needed to insert and maintain IUCs perform such tasks (Parker et al., 2009).

Section 2: Literature Review of Scholarly Evidence

Introduction

Research has long indicated that many IUCs are unnecessary in hospitalized and nursing home patients (Gokula, Hickner, & Smith, 2004). Nurses' education can have a huge impact on the quality of care provided and patient outcomes (Rosenthal, Guzman, & Safdar, 2004). Nurses must be empowered, then engage in EBPs to stay on top of best practice guidelines. This study may decrease the length of stay, increase revenue and CMS reimbursement, and create a patient safety process that empowers staff and patients to participate in their plan of care (Gould, Umscheid, Agarwal, Kuntz, & Pegues, 2010).

Literature Search Strategy

The search strategy included an electronic database search of published and unpublished articles extracted from MEDLINE, CINAHL, PUBMED, amd the Cochrane database for systematic and peer reviews to identify keywords within the title used to describe relevant interventions. In addition, a search was performed using all keywords and index words, references lists, and bibliographies to answer the research study. The web based search engines Google and Yahoo were also utilized to access the Centers for Disease Control and Prevention with key words.

Keywords

To identify nursing interventions in preventing CAUTIs, a systematic search of the literature was done using the keywords: *nurse*, *evidence-based practice, nursing knowledge, catheter urinary tract infection, urinary tract infection, CAUTI rates, nursing intervention, effects on nursing education, decreasing CAUTIs, systemic review, indwelling urinary catheter, education, clinical practice guidelines*, and *best practice*.

Boolean searches using and/or and keywords such as *CAUTI, CAUTI rates,* and *indwelling urinary catheter* found 275 total articles and 75 direct articles that matched nursing interventions used to decrease CAUTIs.

Literature Review

Specific Literature in Nursing Education

Nurses educated in use and management of IUCs can impact the development of CAUTI and serve to reduce CAUTI risks (CDC, 2010). The CDC guidelines recommend education include proper insertion techniques for IUCs, management and care, appropriate indications, duration and prevention of potential complications with IUCs (CDC, 2010). Additionally, there have been few studies evaluating CAUTI nursing education as an intervention to decrease CAUTIs (Rosenthal et al., 2004). Willson et al. (2009) indicated the shortcomings of insufficient evidence to provide specific recommendations concerning the effectiveness of nursing education. Therefore, more evidence is needed as to whether nursing education on evidence-based guidelines is effective in reducing CAUTI.

Nurses are required to have the ability to improve patient care, increase positive quality outcomes and decrease negative outcomes with patients. EBPs and guidelines such as CAUTIs are critical recommendations that impact nurse's practice. It is crucial that nurses are updated on policy revisions and provided with much needed annual training and education related to IUCs indication and maintenance practices. For example, Drekonja, Kuskowski and Johnson (2010) found inconsistencies in nurses' knowledge regarding IUCs. After re-education and training, modest decreases appeared in the number of catheter days and inconsistencies of patient care making it evident that

the lack of knowledge of IUCs impeded the effectiveness nurses played in preventing CAUTIs. In comparison, less than half of research studies identified skills validation of IUC insertion competency and less than two-thirds provided CAUTI prevention practice education during nursing orientation (Fink et al., 2012).

Similarly, educating nurses using a videotaped review of catheter care versus education on revised policies of CAUTIs has also shown to be effective in decreasing CAUTIs by half within 18 months showing the effectiveness of re-education (Goetz, Kedzuf, Wagener & Muder, 1999). In addition, further education on revised policies regarding CAUTIs alone showed a minimal effect of 1.2% in reducing CAUTIs (French, Cheng, Wong, Donnan., 1989). Various teaching methods have also been used in order to reduce CAUTIs and change practices. These include combining nursing education and performance feedback on CAUTI incidences after re-education and focusing on nurses compliance with hand hygiene that decreases the incidence of CAUTI from 21.3 days of infection per 1000 catheterized days to 12.4 per 1000 (Rosenthal et al., 2004). Proven that educating nurses and ensuring they wash their hands using antiseptic soap may have a tremendous effect on the incidence of infection (Rosenthal et al., 2004). On the other hand, combining nursing leaders and staff nurses' education with autonomy, accountability and decision making authority regarding IUC usage did not produce statistically significant difference in fiscal year 2007, but found a significant reduction in CAUTI rates (Wenger, 2010).

In a two-part evidence-based systematic review report card by Willson et al. (2009) similar intervention techniques were used. The results of these studies provide limited evidence suggesting that staff education and feedback may reduce CAUTI rates.

Therefore, further investigation of educational programs along with staff education regarding IUCs appropriate indication, maintenance and care, insertion and removal techniques, and regular feedback is essential in decreasing CAUTI rates in acute care hospital (Willson et al., 2009).

According to the CDC and the Joanne Briggs guidelines, nurse's education on insertion techniques, management and prevention is the foundation to reap the potential benefits and contributions to patient outcomes and risk for preventing UTIs (Willson et al., 2009). These studies results revealed multiple key interventions: nursing education, nursing driven protocols and nurse's perception of IUCs. Although the studies have simpler interventions but slightly different approaches, they all revealed a significant relationship between nursing education and decreasing CAUTI rates. In addition, the studies showed that it was highly noted that nurses are the frontline staff that affects the patient care outcomes, patient satisfaction and positivity (Bower, DePaoli, Hertach & Horton, 2012).

The management of patients with IUCs is a significant issue and risk of infections that will need to be addressed beginning in the community, emergency room and within the inpatient settings in order to prevent these infections. Developing an educational program was determined by Burnett et al. (2010) to be a vital strategy for decreasing the usage and duration of IUCs thereby decreasing CAUTIs. Emergency room nurses knowledge of best practice guidelines regarding IUCs is significant to nursing. Evidence-based- guidelines enhances nurse's knowledge and contributes to promoting excellence in patient care (Burnett et al., 2010). Furthermore, enhancing nursing knowledge is important to the organization as it is based on utilizing best nursing practices to provide

quality care that is safe and assists in the prevention of HAIs, such as that of CAUTIs (Burnett et al., 2010).

Education is also important to the patients by promoting safety and ensuring that preventative measures are implemented to reduce the risk of CAUTIs (Burnett et al., 2010). In addition, it was found that annual re-education and reinforcement of the required behaviors will provide nurses with the comprehension required to practice appropriate catheter insertion technique and care (Burnett et al., 2010). Dingwall and McLafferty (2006) stated there is a need to understand the translation of knowledge into practice regarding EBPs and guidelines of IUCs. Therefore, further studies have become essential to the importance of nursing education in EBPs for the reduction of nurse-driven indicators such as CAUTIs.

General Literature

Types of indwelling urinary catheter.

There have been various strategies used in an effort to prevent or decrease CAUTIs. These strategies fall in the category of different types of catheters, materials, or alternatives to IUCs (Trauter, 2010). The use of silver coated IUCs or impregnated urinary catheters versus standard silicone or latex catheters has been the subject of health related research as a risk reduction and best practice strategy to help decrease CAUTIs (Kumon, Hashimoto, Nishimura, Monden, & Ono, 2001). The mark up of antimicrobial IUCs has been somewhat elevated, and silver-alloy and nitrofurazone impregnated catheters have shown a reduction in bacteriuria in short term use of IUC (Trauter, 2010). Furthermore, no studies have identified a significant benefits in symptomatic CAUTIs in short term use, and no adequate studies have been done of microbial catheters for long-

term use over 30 days (Jahn, Beutner, & Langer, 2012). In addition, studies have validated that short term use of antimicrobial effects diminishes in the second week of using these catheters (Schumm & Lam, 2008). Earlier studies of silver-coated catheters prior to 1999 have also showed greater benefits in IUC usage. Silver-hydrogel-coated catheters have been compared with uncoated latex catheters, raising questions of whether the beneficial effects were due to hydrogel rather than silver (Crnich & Drinka, 2007).

Srinivasan, Karchmer, Richards, Song, and Perl (2006) used a crossover study comparing silver alloy to hydrogel silicone catheters in 3,000 participants within an acute care setting and found no difference between groups, even though this pre/post study design was subjected to the Hawthorne effect bias. Furthermore, the study used urinary cultures collected by the clinical staff rather than daily cultures collected by the research participants, suggesting the clinical relevance of delaying the onset of bacteriuia. In a different manner, Stensballe et al. (2007) performed a randomized; double blinded controlled trial to compare nitrofurazone-impregnated silicone catheters versus control silicone catheters in 212 trauma patients admitted between July 2003 and August 2005. The results showed a significant delay in the onset of bacteriuria and fewer instances of new or changed antimicrobial therapy in the nitrofurazone group (Stensballe et al., 2007). Lastly, a correlational study conducted by Lai and Fontecchio (2002) on the use of silver-hydrogel urinary catheters in a tertiary care medical center also found minimum reduction in hospitalization costs and CAUTIs in patients requiring an IUC in its anniversary year.

Nurse-led interventions/informatics-led interventions

Health informatics-led interventions use information technology such as computerized order entry that automatically prompts healthcare providers with best

practice alerts to take action with regard to specified and defined interventions (Yin-Yin et al., 2013). This science integrates nursing information and knowledge with communication technologies to benefit the health practices of individuals. Informatics as a technological advancement will make it possible to have positive interventions to relieve some of the human element leading to the cause or CAUTIs (Yin-Yin et al., 2013).

Health informatics systems are additional strategies necessary to have in order to decrease CAUTIs. Electronic health records can provide researchers, healthcare professionals, and regulatory agencies with rich datasets for quality measurement, assurance, and improvements (Blodgett, 2009). Several strategies have also shown promising results for decreasing CAUTIs, which can also be used to remind nurses and physicians to remove unnecessary IUCs. Several researchers preformed research studies that focused on acute care patients, prompt removal of catheters, outcome measures of the duration of IUCs, and the incidence of CAUTIs (Blodgett, 2009). These studies concentrated on the incidence of CAUTIs and reducing the duration of IUC usage. The use of information systems is congruent with the current literature of the CDC recommended guidelines for nurse assessment of the appropriate use and prompt removal of IUCs, but nursing education on best practice guidelines would be required in order to have an impact on CAUTIs and patient outcomes.

Computerized reminders, documentation, and best practice alerts can come with a heavy price tag and investments of time but offer some important advantages (Blodgett, 2009). Benefits of computerized reminders can be linked to physicians' order entry and nursing documentation for easy monitoring. Cornia, Armory, Fraser, Saint, and Lipsky

(2003) found that documentation of catheter orders was significantly more common among patients on units with computerized physician order entry (CPOE) than on units without CPOE, results of 92% vs. 29%, $p < 0.001$). Various quantitative studies have also shown a decrease in inappropriate insertion of IUCs and duration of catheterization occurs when using computerized stop orders, nurse generated reminders, and nurse empowerment to remove catheters (Cornia et al., 2003). Computerized stop order have been found to decrease the duration of IUCs usage in hospitalized patients by 1.34 days but does not decrease CAUTIs (Loeb et al., 2008). On the other hand, using twofold modalities that include technology computerized order entry and handheld bladder scanners along with nurse education and empowerment have proven to be successful in reducing IUCs device usage by 81%, duration of 73%, as well as the incidence of CAUTIs (Topal et al., 2005).

However, Elpern et al. (2009) in a quasi-experimental design recommended a different approach of having daily consultation and review of each patient with an IUC in a medical intensive care unit; the study showed a significant reduction in the number of IUC usage and CAUTIs. A major strength with electronic reminders is that it complies with CDC's recommended guidelines in decreasing IUC usage duration, but it lacks sustainability unless it is incorporated with training and education for nurses regarding best practices. Nurses have shown that when properly trained and given the autonomy to practice to the full extent independently, discontinuing IUCs based on best practices produced significant decrease in CAUTIs (Kramer & Schmalenberg, 2008). Such practice increases patient safety, leads to positive outcomes, and decreases cost to patient and hospitals.

In one study, the intervention's main focus was daily reminders from nurses to physicians to remove unnecessary IUCs 4 days after insertion (Crouzet et al., 2007). Current evidence does not recommend leaving an IUC in place for 4 days before evaluating whether it is appropriate or not. In addition, this nurse-led intervention relied solely on the nurse communicating with the physician to determine the necessity of the IUCs and permission to remove it. The CDC guidelines explicitly identified appropriate indications for IUCs usage and removal. In addition, the AACN stated that CAUTIs is a nurse sensitive indicator, and educating and training nurses on the evidence-based recommendations will have an impact on decreasing CAUTIs (Crouzet et al., 2007). Although nursing education was not done, the analysis showed no overall change in the reduction in length of time the catheter was inserted. However, there was a statistically significant reduction in CAUTI rates on all five units from 10.6 to 1.1 per 100 patients and the incidence of late CAUTI decreased from 12.3 to 1.8 per 1000 catheter days (p = 0.03; Crouzet et al., 2007). The study validated that a simple measure of nurse-led reminders can demonstrate a reduction in CAUTIs.

Similarly, nurse-led multidisciplinary rounds have shown significant reduction in the rate of IUCs utilization from 203 IUCs days per 1,000 patient-days in the pre-intervention phase to 162 IUCs days per 1,000 patient-days in the intervention phase (Fakih et al., 2008, p. 2). Recommendations suggested that giving nurses autonomy while using a multidisciplinary team approach and education on best practices is associated with reducing unnecessary IUC usage. Further efforts to sustain the intervention may be successful when all nurses are trained and empowered to advocate for their patients. Robinson et al. (2007) in the same way used a retrospective and prospective design using

a 2-week prospective arm. During this design, the charge nurse identified patients without clear indications for the use of an IUC and requested discontinuation of the unneeded catheters. The impending results showed a 67% reduction in the number of days of catheter usage along with a 26% reduction in the number of CAUTIs when compared to the results of the retrospective arm (Robinson et al., 2007).

Lastly in this literature review, Oman et al. (2012) shed light on suggesting that collecting staff perceptions of IUCs and evaluating behaviors may assist in validating misconceptions about IUC use. The extended use of IUCs has forced hospitals to develop and evaluate new strategies to decrease use due to the many complications and the increased cost. In a 22-bed, mixed medical-surgical and trauma intensive care unit, Reilly et al. (2006) explored the effects of a multidisciplinary team approach, bladder scan usage, silver-coated catheters, decision algorithm, and nursing education on IUCs practices, usage, and indications. A randomized control convenience sample of 124 patients charts for pre-intervention study and 83 charts for post-intervention results showed a decrease in IUC device days of 4.72 with a SD of 7.67 (n = 124; p = 0.38). Although there were multiple interventions, it was noted that changing healthcare providers' behavior is a challenge that most institutions encounter, including nursing professionals who are the forefront of patient care that play a vital role in initiating quality outcomes (Yoon et al., 2013).

In conclusion, the studies presented used different approaches and interventions to test variables that may have an effect on decreasing CAUTIs. Registered nurses represent the largest employed population within a hospital setting and play a critical role in reducing IUC usage and patient complications (Bernard et al., 2012). Therefore, further

research could assess the benefits of targeted education towards nurses about IUCs usage, indication, management, care, cessation, and the effect that education has on systems to ensure IUC removal at appropriate end points (Bernard et al., 2012). In addition, based on the results of this study, further education for undergraduates and nurse residency programs could be integrated with a deeper knowledge of IUCs. Lastly, the literature review identified the need to understand the transfer of this knowledge into practice.

Conceptual Models/Theoretical Framework

The framework used to guide this study was the Iowa model of EBP by Titler. This model is nationally known for its use in research to improve patient care and help nurses understand how to perform a research study and apply it to practice. The evidence-based model focuses on three steps: identifying a problem, reviewing and critiquing research studies that support the changes in clinical practice, and implementing a change in practice while monitoring outcomes (Doody & Doody, 2011). The Iowa model of EBP provides a guideline for healthcare staff to address questions such as, "How can we improve the practice?" and/or, "What does the latest evidence tell us about this patient's problem?" Today, the guidance of EBP is derived from many sources such as clinical trials, observational studies, outcome research, and case studies. For nursing, the framework for decision-making has traditionally been the nursing process (Melnyk & Fineout-Overholt, 2005). This concept of EBP goes beyond healthcare providers and patients; instead it is important for it to be part of the organizational culture in order to be applied into practice (Melnyk & Fineout-Overholt, 2005).

Nursing knowledge and decision-making skills are referred to as evidence that contributes to the validity of the variable (Doody & Doody, 2011). Accountability of

nurses requires these professionals to meet four principles: feasibility, appropriateness, meaningfulness, and effectiveness (Doody & Doody, 2011). Additionally, awareness is one key aspect needed for nurses to function in an EBP approach that includes how to introduce, develop, and evaluate EBP. The Iowa model plays a crucial role by providing the tools necessary to focus on organizational collaboration and encouraging understanding of the avenues to decreasing CAUTI rates, translating knowledge into practice, and understanding indications to develop new standards that comply with the evidence-based recommendations of IUCs (Doody & Doody, 2011).

The Iowa model consists of seven steps that assist with framing a process in order to decrease CAUTIs. This model focuses on the knowledge and problem-focused triggers leading the staff to question additional nursing practices (Titler, 2006).

Step I: Identifying the trigger: CAUTIs were identified by the investigator as a knowledge focus trigger since many nurses were not aware of the negative impact or benefits of not using IUCs, and nurses were not routinely engaged in preventative practices with patients (Polit, 2010). New guidelines supporting the usage and maintenance of IUCs had been recently implemented in January of 2012 by the CDC. To establish the need for EBP, the CAUTI nurse coordinator and I performed a needs assessment and evaluated the organization CAUTI rates. The results showed that many nurses were unaware of CMS guidelines and the cost to both the patient and organization from acquiring and treating CAUTIs (Schneider, 2012). Lastly, the overall CAUTI rates on the selected medical surgical unit is 3.9/1000 IUC days. The organizational goal is to decrease CAUTI rates to 0 on the selected medical surgical unit or below the National Healthcare Safety Network (NHSN) benchmark of 1.6/1000 IUC days.

Step II: Endorsement of CAUTIs as a facility priority: The priority for the organization is to decrease CAUTI rates to or below the recommended NHSN guidelines throughout the organization. In order to gain endorsement by both the medical surgical leadership as well as facility-wide leadership support of an educational intervention in order to decrease CAUTI rates, I presented an initial evidence table. The table detailed the most current recommendation, relevant literature on best practices, and usage of IUCs featuring the last 12 months of the selected unit CAUTI rates. The staff nurses were given the opportunity to express their concerns, barriers, and solutions to implementing an educational intervention in order to prevent or decrease CAUTI rates.

Step III: Assemble a team: The team consisted of nurse champions, an infection control nurse, physician champion, quality improvement specialist, medical surgical leaders, epidemiologist, and the CAUTI nurse coordinator. Titler et al. (2001) stated that teams should be developed by topic selected and include interested, interdisciplinary stakeholders in care delivery. The team was challenged with developing, implementing, and evaluating EBPs of IUCs (Titler et al., 2001).

Step IV: Assembling and reviewing evidence: Efforts was taken to compile and review literature on CAUTI recommendations, approaches, and nursing interventions. The Iowa model suggests that healthcare professionals discuss research together so that they understand the scientific basis for the changes in practice. In addition, nurses will be taught the critique process and how to apply research findings into practice (Titler et al., 2001). A recent literature search on the CDC/NHSN IUC guidelines was performed using MEDLINE, CINAL, PUBMED, and the Cochrane database review. According to Polit (2010) performing meta-analysis can facilitate a strong argument for implementing an

educational intervention to reduce CAUTI rates. The CAUTI nurse coordinator and I were responsible for the ongoing evaluation of the study outcomes.

Step V: Translating research into practice through critique and synthesis: This step involved an ongoing evaluation. After IRB approval, the educational intervention was implemented on the selected medical-surgical unit with all licensed nurses. Additional literature reviewed showed the use of bladder scan and frequent peri/IUC care can help decrease CAUTIs, in return decreasing CAUTI rates. A step by step poster displaying guidelines, a power point presentation, and pocket cards were displayed as supportive documents during the educational intervention. The infection control nurse champion and CAUTI nurse coordinator evaluated and approved the materials for the educational intervention.

Step VI: Piloting the change: Once the study was implemented the nursing staff waseducated on the best practice guideilines with targeted outcome of descreasing CAUTI rates on the seleted medical surgical unit.

Step VII: Full implementation & follow-up: This step included an evaluation of the EBP change, modification of the organization's protocol, and CAUTI guidelines. The results were intergrated into the organizations nursing pratice and department orientation. Lastly, the new practices will be included into the annual nursing competency training and the institution infrastructure for long-term evaluation of the outcomes.

Nurses comprise the largest percentage of employed staff in healthcare organizations that provide direct patient care. Therefore, nurses have an opportunity to influence clinical care, preventative measures, illness, and recovery (Brown, Wickline, Ecoff, & Glaser, 2009). If care is not evidence-based, the potential of negative patient

outcomes increases (Newell & Burnard, 2006). Nurses staying current on new EBPs allows for better patient care and outcomes but are continually challenged with producing measurable outcomes in patient care and to set higher standards of care (Brown et al., 2009). Therefore, nurses must actively engage in reading, critiquing, and grading the evidence to continually challenge their practice (Brown et al., 2009).

Summary

Healthcare organizations have been challenged since the 1960s to provide safe quality care to all patients. Nursing roles are very influential to address patient needs while utilizing EBPs to reduce avoidable patient complications. CAUTIs are considered one of the nurse sensitive indicators that reflect on nursing practice and its effects on patient care outcome (Saint et al., 2008). Hospitals are charged with addressing and reducing CAUTIs or face the financial burdens of a reduction or zero government reimbursements of patients care to treat this infection (CMS, 2010). Saint et al. (2008) discussed that approximately 5% of hospitalized patients per day have a high incidence of acquiring CAUTIs. Smith (2003) estimated that CAUTIs incur an additional $3,000 in medical expenses for patients and healthcare organization.

Evidence explicitly indicates that IUCs are overused, lack proper monitoring, and are inserted for inappropriate indications, causing an increase in infections and CAUTI rates (CDC, 2010). It is also evident that nursing education intervention poses a significant positive impact on quality of care in hospitalized patients in all settings (Robinson et al., 2007). IUCs are considered a one point restraint, are painful, and produce negative outcomes that significantly increase the final cost to the organization and patients (Robinson et al., 2007). The literature review reveals a strong need to

investigate the effects of nursing education on best practice guidelines to reduce CAUTIs. There are multiple research studies that assess nursing intervention in order to reduce CAUTI rates with limited studies in assessing the effects of nursing education on patient outcomes with IUC usage (Parker et al., 2009). Lastly, there is clear evidence that EBPs can improve patient outcomes when implemented and supported by front line staff, and the Iowa model of EBP clearly helps nurses integrate these practices in the clinical setting (Fanning & Oakess, 2006).

Section 3: Design and Methodology

Introduction

The purpose of this study was to determine if nursing education on EBP guidelines regarding IUCs will decrease CAUTI rates on one medical-surgical unit. This section presents the methods used in the study which include the purpose, design of the study, population, sample selection, instrument validity, reliability, and data collection strategies. Prevention of CAUTIs is centrally linked to nurses' practices and patient outcomes. Nursing roles are very influential when addressing patient needs while utilizing EBPs to reduce avoidable patient complications. CAUTI is a nurse-driven indicator that reflects on nursing practice (Saint et al., 2008). Lastly, nurses have the professional duty to replace non-evidence-based routines and practices with EBPs while translating knowledge into practice (Haxton et al., 2012).

Design and Methodology

The study used a quasi-experimental, one group, before-and-after design to examine whether there was a significant relationship providing nurses with evidence-based education on IUC usage and CAUTI rates. The intervention consisted of an educational session on evidence-based guidelines deployed by the NSHN, a division of the CDC. The investigator used a convenience sample of registered nurses to be educated on best practices, and CAUTI rates were evaluated retrospectively using a chi square analysis to determine whether there was a significant difference in the CAUTI rates before and after educational intervention. This allowed the researcher to account for any inconsistencies in the number of IUC days. Another variable that was considered based

on intervention along with the CAUTI rate was the IUC utilization. This was crucial because CAUTI rates should have decreased with respect to a drop in utilization.

Intervention

Staff Education and Training

The goal of this study was to disseminate evidence-based knowledge to medical-surgical nurses regarding CAUTI rates and IUC usage. The information utilized to prepare the content of the program was based on CDC guidelines along with the organization's policies and protocols regarding management of IUCs. The content and teaching strategies were reviewed by the CAUTI nurse coordinator who is active in implementing EBP. The PowerPoint presentation included the CDC's documented best practice guidelines for IUC insertion, CAUTI bundle care, indications for usage and maintenance, and alternatives.

Prior to the educational intervention, the CAUTI nurse coordinator e-mailed the researcher the baseline CAUTI rates data set of the selected medical-surgical unit. Thereafter, nurses were given a 30 minute, in-depth educational session to decrease the burden on the nurse participants. The educational session was held for 2 weeks, twice a day to facilitate attendance and to capture the day and night staff. Current CDC guidelines for insertion, removal, maintenance, and recommended prevention practices of IUC were discussed in each session: (a) scope and risk of the problem, (b) appropriate indications for usage, (c) the CAUTI bundle IUC, (d) proper insertion techniques, and (e) alternative devices such as the condom catheter. A quick reference pocket guide was given to each nurse who attended the educational session to use as a resource for CDC indications of usage. The educational slideshow was converted into an e-learning module

for future posting and viewing in staff meetings and orientation of new staff nurses, and they were reviewed by the CAUTI nurse coordinator prior to posting on the organization's computer-based learning site. All consent for participation was collected by the principal researcher; staff nurses' demographic characteristics dataset was provided by the organization. The dependent variable that was analyzed for a presumed effect was CAUTI rates.

The pre-CAUTI rate was labeled as 1 and post rates as 2, which were then stored on the password protected computer located in the researcher's private office. According to Burns and Grove (2009), the independent variable assists in identifying whether or not there is a relationship to the dependent variable. The medical-surgical unit had a total of 63 nurses; out of those 63 nurses, three resigned from the hospital and two transferred to another unit, leaving a total of 58 full-time and or pooled nurses to participate in the study. Therefore, an estimated sample size of 51 nurses was required to reach a power of 80% to detect an effect size of 20% with a $p = 0.05$ using a two-tailed *t* test. This study was conducted due to the high CAUTI rates within the organization; based on the CDC guidelines, effective October 2008; HAI within health care organizations that are deemed preventable will no longer be reimbursed. CAUTI was named a *never event* and can be reasonably preventable by following evidence-based guidelines.

CDC/NHSN Summary of Recommendations

The NHSN is nationally known as the nation's most widely used tracking system for HAIs, providing healthcare organizations with tools to identify infection prevention problems. NHSN benchmarks healthcare organizations 'compliance with state and federal regulations in decreasing never event infections (CDC, 2010). The CDC 2009

recommendation focuses on the prevention of CAUTIs as well as other HAIs that are deemed never events. Never events are preventable infections; provided they are monitored accordingly and best practices are adhered to (CDC, 2010). In an attempt to decrease CAUTIs, the CDC used research to develop recommended guidelines in order to help organizations decrease CAUTIs and related high costs of treatment (CDC, 2010). The CDC recommendations are organized as follows: (a) recommendations for patients who should receive IUCs or certain population alternatives to IUCs; (b) recommendations for IUC insertion; (c) recommendations for catheter maintenance; (d) quality improvement programs to achieve appropriate placement, care, and removal of catheters; (d) administrative infrastructure required; and (e) surveillance strategies (Appendix K; CDC, 2009).

Setting

This study was conducted on one 40-bed medical and surgical unit within a 921-bed, acute care Level I trauma hospital in Atlanta, Georgia. Approval to conduct the study was approved by the organization's Research Oversight Committee and a secondary approval was granted by Walden University's Institutional Review Board (IRB) prior to implementation of the study. The selected unit's average daily census is 36–40 patients with a total of 63 licensed nursing staff. On average there was 4–6 patients with an IUC on any given day, and patients' average mean age ranged between 19–85 years. The unit encompasses a large population of surgical patients from general surgery, trauma, plastic surgery, vascular surgery, neurology, and urology, and patients from other services may also be admitted to the unit.

Population and Sampling

This study was conducted over a period of 3 months; at the end of the first month, the CAUTI nurse coordinator gave the researcher the organization's datasets of the selected unit's baseline CAUTI rates. During the second month, nurses were recruited via the staff's monthly meetings and e-mail. E-mails were sent through the secure hospital staff e-mail and prior to the unit's standard staff meeting. The director gave permission to recruit and discuss the study 15 minutes before the staff meeting. The unit director and leadership were not in attendance in order to prevent the staff from feeling obligated to participate.

The independent variable for the study was the knowledge level of the staff nurse. The dependent variable that was evaluated for a presumed effect was CAUTI rates. The pre-CAUTI rates were labeled as 1 and post rates as 2, and stored on the password protected computer located in the researcher's private office. The study unit has appropriately 63 nurses; 53 are employed full time, and 10 are supplemental staff. Therefore, an estimated sample size of 51 nurses was required to reach a power of 80% to detect an effect size of 20% with a $p = 0.05$ using a two-tailed t test.

All nurses possess either an associate or a bachelor degree in nursing and were invited to participate in the study. Recruitment of all registered nurses (RNs) and licensed practical nurses (LPNs) was conducted through staff meetings and flyers. A convenience sample of registered and licensed practical nurses was used due to the accessibility of participants. This sampling criterion was chosen for recruitment because the participants were easily accessible on the select unit and is a representative of the targeted population for the project. Inclusion criteria are all RNs and LPNs on the selected unit. Exclusion

criteria were non-nursing personnel such as nursing assistants and patient care technicians who give direct patient care.

Data Collection

The overall responsibility for data collection rested on the organization's epidemiologist and infection control nurse. CAUTI datasets were sent to the principal researcher for chi square analysis in order to determine if there was a significant different between the pre- and post-CAUTI rates. The epidemiologist collects and tracks all CAUTI data within the hospital and then analyzes the data at the end of the month using the CDC/NHSN surveillance guidelines. The epidemiologist in the facility is the person who studies the patterns of disease and infection occurring in the organization such as CAUTIs and determines if they follow the proper guidelines according to NHSN definition. After the epidemiologist has completed the analysis, the CAUTI nurse coordinator was e-mailed the datasets for review. Thereafter, I reviewed the baseline CAUTI rates prior to implementation of the educational intervention. The CAUTI rates before and after the educational intervention was calculated by the organization epidemiologist who evaluates IUC days. These data were collected from the electronic medical records by the epidemiologist. The data collected by the epidemiologist were analyzed as shown below and then entered into the NHSN database. The formula that the epidemiologist used according to NHSN to calculate CAUTI rates and the device utilization ratio (DU) is:

(1) $CAUTI\ Rates = \frac{\#\ CAUTI\ Identified}{\#\ of\ IUC\ Days} x\ 1000$

(2) $DU\ Ratio = \frac{\#\ of\ Idwelling\ Catheter\ Days}{\#\ Patient\ IUC\ Days} x100$

The study took place in three phases. The first phase consisted of the researcher receiving the pre-intervention CAUTI rates of the selected unit. The data was sent via e-mail to me from the CAUTI nurse coordinator. In addition, recruitment of staff was via an educational posting regarding CAUTIs hung on the unit's education board. In the second phase, the educational intervention was initiated and consisted of a 30-minute educational session and time for: (a) signing the consent forms and answering questions, (b) completion of the PowerPoint presentations with questions, (c) skills validation on proper IUC insertion and removal technique and, (d) use of the bladder scan. The last phase of the study the researcher received the post-intervention CAUTI rate. The researcher compared CAUTI rates for the 1-month pre-intervention period with those for the post-intervention period using a chi squared test to calculate if there was a statistically significant difference in the CAUTI rates (Table 2).

Instruments

The key dependent variable that determined if there was a presumed effect was CAUTI rates. CAUTI rates were measured using the CDC/NHSN surveillance tool. This surveillance tool assists organizations in calculating the incidence of catheter-associated UTI by dividing the number of UTIs by the number of Foley catheter days and multiplying by 1000 (UTIs/1000 Foley days). These calculations are considered standard for catheter days at the same time each day per nursing unit (CDC, 2010). In addition, an organizationally approved IUC audit form adapted from the CDC/NHSN surveillance tool was used to track trends in maintenance, usage, and documentation compliance. The nursing education intervention provided the independent variable of nursing knowledge for decreasing CAUTI rates. Lastly, the study included demographic characteristic

variable measurements: RNs and LPNs, years of experience, sex, race/ethnicity, highest level of education completed, and age.

CDC/NHSN Surveillance Tool

The researcher did not analyze pre-and post-CAUTI rates but received the datasets from the CAUTI nurse coordinators within the organization. The organization used the CDC/NHSN surveillance protocols standards in order to validate whether a decrease in CAUTIs rates was detected at the organization relative to the unit's base levels. The CDC/NHSN defines excellence in healthcare by providing standardized surveillance tools that the infectious control department adheres to when reporting infection rates. The CDC/NHSN definition of CAUTIs is incorporated into the institution's policies and procedures for managing IUCs. These standard protocols have been used by local, regional, and national organizations that pursue and define excellence in healthcare. The recommendations include ensuring that connections between the IUC and the drainage system is not broken except to meet clinical requirements; ensuring that daily meatal hygiene is performed; ensuring that the drainage bag is emptied when clinically indicated; daily review of the necessity of the IUC; and prompt removal if there is no appropriate indication for usage (Appendix I). .

Indwelling Urinary Catheter Audit Form

The researcher did not collect patient data, as these were predetermined by the selected healthcare organization. The hospital's data collection form includes admittance date of the patient, a unique identifier number, IUC insertion date, number of IUC days, securement device in place, tubing free of loops or obstructions, correct bag placement, IUC bag off the floor, container not overfilled, IUC/Peri-care completed and documented,

no breaks in catheter seal, appropriate necessity documented on LDA Flow sheet, and is the necessity supported by the documentation (see Appendix J). A daily log is secured indicating the trends of monthly infection rates throughout the healthcare organization.

Demographic Data Form

According to Burns and Grove (2011), demographic variables are used to depict the characteristics of the individuals surveyed, and these metrics include ethnicities, socioeconomic backgrounds, race, and age demographics. These types of questionnaires are one of the most used instruments in research and must be constructed carefully, while also being reliable and valid (Shaughnessy, Zechmeister, & Jeanne, 2011). The demographics characteristics of the nurses on the unit, with any personally identifying information removed, were provided by the organization and e-mailed to the principal researcher. Flyers were posted on the unit of the study with the researcher's contact numbers for any questions or concerns. Inclusion criterion was all nurses, and the only exclusion criterion was nurses who declined to participate, or those nurses who were on leave or absent during the study. The demographic dynamics were analyzed using descriptive analysis in determining the mean years of experience, sex, race/ethnicity, and highest level of education completed, and age.

Reliability and Validity

Quasi-experimental designs enhance the potential of a study to make a widespread impact on a population's health (Friis & Sellers, 2014). This type of experimental design is reliable when it focuses on interventions geared towards education and behavior change at the population level (Friis & Sellers, 2014). In addition, because there is no randomization of subjects, the design is susceptible to internal validity

selection. In order to reach valid causal inference, quasi-experimental design's threats to validity must be explicitly controlled. Internal validity problems may occur with maturation effects, history effects, and testing effects (Friis & Sellers, 2014). Quasi-experimental designs may also help to determine reasons for success or failure of an intervention, to compare cost and benefits, and to suggest changes in current health policies (Friis & Sellers, 2014).

Standardized methods and definitions are imperative to improve the reliability of the data collected. NHSN surveillance methodology consistency has been proven to be reliable and valid nationally in measuring CAUTI rates. Surveillance criteria are designed to look at the population at risk, identify those patients meeting the criteria, consistently apply the data, ensure the comparability of the data, and strengthen the validity of the data (Friis & Sellers, 2014). Furthermore, a quasi-experimental, before-and-after design allows the researcher to measure infection rates and improved adherence to process measures after the intervention (Ranji et al., 2007).

Protection of Human Subjects

The researcher was responsible for implementation of the EBP education. All staff involved in the research project had completed the web-based training course, "Protecting Human Research Participants." A completed application for the EBP was approved by the institution's Research Oversight Committee. To ensure the protection of human rights, all participants were asked to sign a consent form after discussion of the purpose of the study and advantages and disadvantages of insertion of an IUC. The participants were asked to sign the consent form, and the researcher and nurse CAUTI coordinator collected all hard copies and stored them in the coordinator's private office in

a locked cabinet that only the researcher has access to in order to ensure confidentiality of data. At the end of 5 years, all data will be destroyed.

Data Analysis

The CAUTI rate per 1,000 urinary catheter days is calculated by the epidemiologist by dividing the number of CAUTIs by the number of catheter days and multiplying the result by 1,000. The urinary catheter utilization ratio was calculated by dividing the number of urinary catheter days by the number of patient days for the 3-month duration of the research project, and the dataset was e-mailed to the researcher. CAUTI rates and demographic data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 22. IUC data was already collected once a week for one month pre-intervention and one month post-intervention phases. This included the unit being monitored, the number of CAUTIs on the unit, the number of IUC or device days, the calculated CAUTI rate, and the pooled mean for comparison. A chi squared test was performed to determine evaluate whether there was a significant difference in the CAUTI rates before and after educational intervention, and demographic data were analyzed using descriptive analysis in determining the mean gender, age, ethnicity, educational level, and years of experience (Appendix B).

Summary

Wallin, Profetto-McGrath, and Levers (2005) stated that EBP guidelines come from valid and up-to-date research that has showed successful improvement in patient outcomes and quality care. However, research alone will not be the determining factor in changing clinical practice (Drekonja, Kuskowski, & Johnson, 2010). Quasi-experimental designs are quantitative and include interventional research that will help explain the

relationship between knowledge and practice (Terry, 2012). This study design will help to assist the translation of evidence-based guidelines and knowledge into practice. Furthermore, it is vital for the researcher to have a keen awareness of the healthcare provider's practice and processes to successfully implement these practices based on the best evidence (Titler & Everett, 2006). According to Carr (2000), IUCs are one of the most frequently utilized devices used in hospitalized patients, and additional investigation is needed for prevention of CAUTI.

Section 4: Discussion and Implications

Introduction

This study was designed and conducted to examine the effects of nursing education on evidence-based guidelines regarding IUC indications, insertion, maintenance, and removal for nurses on a medical-surgical unit to see if there was a decrease in CAUTI rates. The goal was to view a decline in CAUTI rates after providing nurses on a medical-surgical unit with education on CAUTI evidence-based guidelines. Furthermore, the results of this study can serve as a solid foundation for decreasing CAUTI rates within a variety of healthcare settings. The objective of this study was to elicit a change in practice through education while promoting downward trends in the incidences of CAUTIs. The research question for this study was:

Does nursing education on best practice guidelines for CAUTIs decrease CAUTI rates in hospitalized patients on a medical surgical unit?

The stated hypothesis for this study was providing CAUTI evidence-based practice education to nurses will result in a decrease in CAUTI rates. The null hypothesis proposed was nursing education for CAUTIs will not have a significant effect on reducing CAUTI rates. The before and after CAUTI rates and the demographic characteristics were provided by the institution to the researcher. The datasets provided were placed in SPSS to be analyzed. The results of this study showed that providing nurses with education on best practices according to the CDC guidelines regarding CAUTIs led to a decrease in CAUTI rates. In the study pre-educational CAUTI rates were 10.40, and post-educational intervention CAUTI rates were 0.00. These differences were statistically significant ($p < 0.05$) and found effective in decreasing CAUTI rates.

Summary and Evaluation of Findings

All licensed full-time and part-time nurses on the medical surgical unit were invited to participate in the educational intervention. Fifty-five nurses agreed to participate in the research study, and all were RNs or LPNs. During the recruiting phase, I posted educational and recruitment posters on the unit's educational board. Prior to the initial educational session, the researcher was sent via e-mail the organizations pre-intervention CAUTI rates. After the recruitment phase, the researcher held the educational sessions for 2 weeks and distributed CAUTI pocket cards for nurses to reference. All of the educational sessions were presented by the researcher.

At the completion of the educational intervention, the organization e-mailed a summary of the study unit's demographic characteristics to the researcher. The demographic data included gender, age, ethnicity, educational level, years of experience, and whether or not they were an RN or LPN. One month post-educational intervention, post-CAUTI rates were e-mailed to the researcher. Pre- and post-CAUTI rates per 1,000 urinary catheter days were calculated by the epidemiologist by dividing the number of CAUTIs by the number of catheter days and multiplying the result by 1,000 according to NHSN protocols. The pre-intervention CAUTI rate per 1,000 Foley days was 10.40% with a device utilization rate of 0.09%, and the unit's post intervention CAUTI rate was 0.0% with a device utilization rate of 0.13% (Table 2). In order to validate whether providing nurses with evidence-based education on CAUTI had a statistically significant effects in decreasing the unit's CAUTI rates, a chi square analysis was performed (Table 3).

Demographic Characteristics

Participants were all licensed RNs and LPNs who worked on one medical-surgical unit in an acute care hospital in Atlanta, Georgia. Fifty-five nurses enrolled in the study, but only 51 nurses completed the educational intervention. One nurse was on leave of absence, two transferred to another unit, one other nurse resigned from the facility, and one other did not attend the educational intervention. Unidentified demographic data were sent to the researcher by the healthcare organization for human rights protection. The unidentified data was placed in SPSS, and participants' characteristics were analyzed in five categories. These categories consisted of age, gender, ethnicity, education level, and years of experience.

The demographic characteristics provided to the researcher showed that the majority of nurses were African American, $n = 34$ (55.7%). There were more female nurses, $n = 50$ (80%), than males nurses, $n = 11$ (18%), and they were predominantly between the ages of 20 and 29, $n = 32$ (52.5%), although the ages ranged from 20 to 60 years. Most nurses held a baccalaureate degree, $n = 46$ (75.4%), resulting in $n = 59$ (96.7%) RNs and $n = 2$ (3.3%) LPNs. Lastly, the data revealed that the highest range of experience on the unit ranged from 1–5 years, $n = 36$ (59%), and the next 6–10 years, $n = 14$(23%). Table 1 summarizes the descriptive statistics for the demographic characteristics of the nurses on the unit.

Table 1

Demographic Characteristics

Age

		Frequency	Percent (%)
Valid	20-29	32	52.5
	30-39	11	18.0
	40-49	12	19.7
	50-59	5	8.2
	60+	1	1.6
	Total	*n*=61	100.0

Gender

		Frequency	Percent (%)
Valid	Female	50	82.0
	Male	11	18.0
	Total	*n*=61	100.0

Ethnicity

		Frequency	Percent (%)
Valid	Caucasian	12	19.7
	African American	34	55.7
	Asian	3	4.9
	Hispanic	2	3.3
	Native American	1	1.6
	Other	9	14.8
	Total	*n*=61	100.0

Degree

		Frequency	Percent (%)
Valid	Diploma	2	3.3
	ADN	11	18.0
	BSN	46	75.4
	MSN	2	3.3
	Total	*n*=61	100.0

Degree

		Frequency	Percent (%)
Valid	Diploma	2	3.3
	ADN	11	18.0
	BSN	46	75.4
	MSN	2	3.3
	Total	*n*=61	100.0

Experience

		Frequency	Percent (%)
Valid	1-5	36	59.0
	6-10	14	23.0
	11-20	9	14.8
	21-25	1	1.6
	25+	1	1.6
	Total	*n*=61	100.0

License

		Frequency	Percent (%)
Valid	Registered Nurse	59	96.7
	Licensed Practical Nurse	2	3.3
	Total	*n*=61	100.0

Statistics

		Age	Gender	Ethnicity	Degree	Experience	License
N	Valid	61	61	61	61	61	61
	Missing	0	0	0	0	0	0
Mean		1.8852	1.1803	2.7213	2.7869	1.6393	1.0328
Std. Deviation		1.09694	.38765	1.96750	.55120	.91347	.17956

Note: n varied due to researcher received unidentifiable data from the organization

Analysis of CAUTI Rates

The organization provided the researcher with the pre- and post-educational intervention CAUTI rates of the selected unit. The CAUTI rates were measured using the CDC NHSN methodology as follows:

$$(1)\ CAUTI\ Rates = \frac{\#\ CAUTI\ Identified}{\#\ of\ IUC\ Days}\ x\ 1000$$

$$(2)\qquad DU\ Ratio = \frac{\#\ of\ Idwelling\ Catheter\ Days}{\#\ Patient\ IUC\ Days}x100$$

The CAUTI rates evaluated by the organization showed a decrease in the unit CAUTI rates from 10.40 per 1,000 catheter days to 0.0 per 1,000 catheter days (Table 2). Although, the data after intervention showed a slight increase in catheter days (96), indicating IUCs were left in for a longer period of time, they also validated that nurses were maintaining the catheters according to the evidence-based strategies to prevent CAUTIs. In addition, the results revealed a slight increase in the device utilization rate (0.13). The device utilization (DU) ratio measures how many IUCs are used on a given unit. Ultimately, the intended purpose was to see a decrease in the DU ratio which would indicate that nurses are using alternatives or the usage is appropriately indicated.

Table 2

CAUTI Rates

October 2014 Nosocomial CAUTIs					
Unit	CAUTI	Foley Days	CAUTI Rate (per 1000 Foley days)	Patient Days	Foley Utilization Rate
Unidentified	1	96	10.4	1068	0.09

December 2014 Nosocomial CAUTIs					
Unit	CAUTI	Foley Days	CAUTI Rate (per 1000 Foley days)	Patient Days	Foley Utilization Rate
Unidentified	0	113	0.0	904	0.13

To accept or reject the stated hypothesis a chi-square statistic was calculated. Pre-intervention CAUTI rates were 10.40 and post- intervention CAUTI rates were 0.00. These differences were statistically significant (X^2=55.00, df =1, p=0.00) (Table 3). The significance value *p* associated with the data was 0.00, which is less than the threshold value of 0.05. Therefore, the study identifies that there is an association between education and decreasing CAUTI rates. In addition, the study has proven to reject the null hypothesis and accept the alternative.

The study hypothesis was as follow:

H_o: Nursing education on CAUTIs best practices will not have a significant effect on reducing CAUTI rates. *Rejected*

H_a: Nursing education on CAUTIs best practices will have a significant effect on reducing CAUTI rates. *Accepted*

Table 3

Chi-Square Analysis

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Education * CAUTI Rates	55	100.0%	0	0.0%	55	100.0%

*Education * CAUTI Rates Crosstabulation*

			CAUTI Rates		
			Decrease in CAUTI Rates	No results	Total
Education	Received Education	Count	51	0	51
		Expected Count	47.3	.3	51.0
		Std. Residual	.5	-1.9	
	No Education	Count	0	4	4
		Expected Count	3.7	.3	4.0
		Std. Residual	-1.9	6.9	
Total		Count	51	4	55
		Expected Count	51.0	4.0	55.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	55.000[a]	1	.000		
Continuity Correction[b]	41.171	1	.000		
Likelihood Ratio	28.670	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	54.000	1	.000		
N of Valid Cases	55				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is .29.
b. Computed only for a 2x2 table

Educating nurses has proven to be a crucial step in preventing CAUTIs and further assessment should be done to encourage nurses to use alternative if an IUC is not indicated and removed them as soon as possible. In order to improve CAUTI rates and decrease inappropriate usage of IUCs healthcare organizations must target education training program to support nursing research and best practices on a continuum. Nurses are the frontline staff to patient care and can drive positive or negative patient outcomes on all nurse-driven indicators. The CDC has developed evidence-based guidelines and strategies to target HAIs such as CAUTIs. These guidelines emphasize key recommendations of IUC usage, insertion practices, alternatives, and maintenance and discontinuation practices. In addition, can be used to create new evidence, change policies and improve organizational protocols. Along with these guidelines the healthcare forum must make sure the translation of evidence-based knowledge is transferred into the clinical setting by supporting EBPs and allowing nurses to take ownership of their profession, while providing them with the necessary leadership support.

The literature has shown that hospitals are still behind in their efforts to adhering to CAUTI evidence-based prevention strategies and policies (Knudson, 2014). There are significant opportunities for improving CAUTIs rates. This study has shown that funding and supporting nursing practices such as evidence-based research and providing

educational resources would be less costly than losing healthcare reimbursement, patient suffering and cost of treating patients with CAUTIs.

Discussion of Findings in the Context of Literature and Frameworks

The Iowa Model of Evidence-Based Practices authored by Tilter (2001) provided a foundation for nurses to integrate EBPs into the clinical setting. The model used was an approximate theoretical framework that proved useful in guiding this study. The acute care hospital have been using IUCs for many years, however, like most healthcare facilities they have not addressed frequent usage and necessities until recently. Meddings et al. (2014) stated that changing practice is not easy and can be costly, but it will cost healthcare organizations more financially without adequately educating nurses about best practices. In addition, lack of prevention strategies knowledge jeopardizes patient safety and the quality of care (Meddings et al., 2014).

Furthermore, nurses can take the lead in using evidence-based prevention strategies to validate guidelines and change practices (Parry et al., 2013). The results of this research study have proven the importance of creating ongoing educational sessions for nurses are vital. Nurses need to be educated, supported and encouraged to take ownership of their practices (IOM, 2011). Parry et al. (2013) noted that aggressive implementation and education of nurse-driven evidence-based protocols and policies were an effective way in decreasing CAUTIs. Nurses participating in evidence-based measures have been a challenge due to the fear and lack of guidance.

The Iowa model of evidence-based practice to promote quality care assist to guide nurses with opportunities to implement evidence-based practices, promote and improve patient outcomes, enhance nursing practices while exposing new research findings and

creating evidence -based guidelines. This framework was well supported as a theoretical framework for nursing research in the literature and still maintains its goal to increase the speed with which the knowledge obtained from research is integrated into patient care (Titler et al., 2001).

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Implications on Practice

In the recent paradigm shift for zero tolerance for preventable HAIs such as CAUTIs, organizational stakeholders must report to NHSN their CAUTI rates and risk the effects of negative patient outcomes and decreased CMS reimbursements. In order to capitalize on the impact of patient outcomes, organizations must maintain their engagement and support frontline nursing staff in educational efforts related to EBPs. IUC usage, care and management are completed primarily by nursing staff. However, minimal studies exist in the literature that supports specific nursing care to prevent the occurrence of CAUTIs for patients with IUCs (Fanning & Oakes, 2006). This educational intervention research study has aided in filling in the gap that can potentially support further educational approaches. Likewise, this study has exposed a great need for organizations to develop research-based educational programs to engage nurses in EBPs. The results showed a significant reduction in CAUTI rates by 100% using the framework of the Iowa Model of Evidence-Based Practice.

These findings validate that the lack of knowledge about EBPs usage of IUCs can be controlled by supporting EBP educational in-services to nurses on a continuum. These educational sessions can be presented in a variety of ways such as, electronic computer-based learning modules, case scenarios, live sessions and posting algorithms along with pocket cards. These practices along with leadership support are a driving force to assist nurses in becoming sustainable through education and revisions of organizational policies and procedures. In addition, the results can be used as a basis for changing practices throughout inpatient and outpatient settings. Therefore, this study has shed light on the importance of engaging and supporting nurses in evidence-based research and education, but also empowers nurses to make changes in their own practice in order to improve patient outcomes. Lastly, this study has revealed the importance of mainstreaming the organization EBPs changing policies, protocols and incorporating it into nursing orientation and annual skills.

Implications for Future Research

IUCs have been used since the 19th century and little attention have been placed on CAUTI prevention until recently. The recent updated preventive strategies to decrease CAUTI rates are recognized as a need to incorporate new research and technological advances that can be expanded across the entire healthcare system. Such as ambulatory care, long term care facilities, nursing homes and all outpatient settings. The change in CMS reimbursement for CAUTIs has created a new landscape for organizations to support frontline staff and enhance educational programs to include nurses applying EBPs into the clinical settings.

These findings validate that clear evidence exists that EBPs can improve patient outcomes and developing educational programs and supporting nurses can have a significant impact on HAIs. This can be accomplished by building on the current EBPs, educating nurses on how to implement those processes and then monitoring compliance and patient outcomes. Additional recommendation includes evaluating and providing educational in-services to nurses on a continuum. Educational sessions can take form in a variety of ways such as, electronic computer-based learning modules, case scenarios, live sessions and posting CAUTI algorithms along with pocket cards. These practices along with leadership support are a driving force to assist nurses in becoming sustainable through education and revisions of organizational policies and procedures. In addition, the results of this study can be used as building blocks that can be spread across disciplines.

Implications for Social Change

Nurses comprise an estimate 80% of the healthcare workforce (Hughes, 2006), and nationally are the frontline staff across the health continuum. Nurses who are supported through educational efforts are introduced to the latest advanced sciences that promote social change. Nurses have the ability on a broader spectrum to improve the quality of care to patients provided and increase efficiencies leading the way in changing today's healthcare system. Frontline nursing staff will assist in progressive social change in the healthcare atmosphere by replacing non-EBPs with EBPs. EBP is a vital tool that will enhance the nursing profession (Fanning & Oakes, 2006). Nurses are allowed to confront and evaluate issues daily and must understand how to obtain and analyze data in order to create a solution based on what is identified. In short, each healthcare

organization must initiate and foster best practices through education with electronic data and sciences. Nurses who understand the value of using the latest advances in science for the improvement of patient care quality and increase clinical efficiencies will lead the way in changing today's healthcare systems and nursing practice.

Summary

The study revealed in order to complement the CDC/HSHN goal of decreasing CAUTI rates up to 70% using evidence-based guidelines it is imperative to engage and support frontline nursing staff in evidence-based research. Furthermore, the results revealed the need for healthcare to develop and support efforts of nursing CAUTI workgroups, research-based committees that implement best practices using an evidence-based framework that can assist in guiding nurses in evaluating patient outcomes.

Project Strengths, Limitations and Recommendations

Strengths

Strengths of the study revealed that building on the current CAUTI recommendations and providing resources to nurses can increase their engagement in EBPs that can have a huge impact in decreasing CAUTIs. In addition, this study adds to the existing research on lowering CAUTIs rates and usage. Furthermore, the material used in the study can be used for future nursing in-services, which in turn will be a useful tool in developing CAUTI bundle protocols. Lastly, the study can be generalized to all nurses and healthcare organizations.

Limitations

There were several limitations that existed in this study. First the study did not provide a before and after test to analyze whether there was a significant difference in the

nurse's knowledge of CAUTI evidence-based guidelines prior to the educational intervention. Additionally, the brief study period of three months limited the ability to measure and report significant findings related to CAUTI rates. Secondly, the study was limited by the population used due to non- randomization. Lastly, the datasets provided by the organization may have created some bias in reporting the selected unit data with the fact that the researcher did not monitor the patients and nurses practices.

Recommendations

The literature reviewed revealed a vast body of methods and approaches used in order to reduce CAUTI rates. In addition, the literature stresses the importance of nurse's practicing and adhering to evidence-based guidelines. Poilt and Beck (2012) stated that EBPs are the conscientious use of current best evidence in making clinical decisions about patient care. This study not only points out the importance of basic nursing measures with an educational approach will enhance nursing practice, but EBP's amongst nurses are being adopted and utilized in practices. Fink (2012) provided a grim picture of nurse's practice for CAUTI prevention, without the use of evidence-based guidelines prevention strategies found that only 89% of nurses routinely washed their hands before IUC placement, IUCs were not monitored for appropriate indication and did not monitor the duration of catheter usage. It is obvious from this study that education is paramount in the successful initiation of CAUTI prevention efforts.

Sustainability can be obtained by building and delivering further educational efforts throughout the organization to all nursing staff on best practices. Additionally, undergraduate nursing programs should incorporate EBPs in their lectures and clinical rotation. Incorporating these practices in all levels of nursing programs will help new

nurses going into practice transition their knowledge and skills into practice. These findings clearly identify that successful introduction of CAUTI guidelines set forth by the CDC depends on factors including the clinical context and the methods used to disseminate, implement and support nursing staff in clinical decision-making. Additional future studies can be focused on nursing knowledge transformation, incorporating all physicians, patient care technicians, and nursing assistance practices. Inclusion of these disciplines can aid in a broader perspective in decreasing CAUTIs rates.

Self-Analysis

Analysis as a Scholar

According to Zaccagnini and White (2011), scholarship of discovery is what continues to grow professional knowledge and is the core to academic growth. Throughout my doctorate of Nursing Practice degree I have advanced my academic approaches ranges from identifying population health disparities, validating EBPs, engaging in healthcare policies and advocacy. Equally important, this journey has given me new light on leadership development, the growing paradigm of technology and the crucial need to eliminate unnecessary infections. These are just a few growth areas that will help me add to EBPs, help translate knowledge into practice and engage nurses. The demand to increase nurse's knowledge is imperative in order to increase the quality of care and positive patient outcomes leading to ownership of nursing practice. I have learned throughout my project that scholarship should not be taken lightly but gasped and applied to practice. The DNP essential explains that as DNP graduates we are examining, creating and changing knowledge that can be applied to nursing practice.

This research study has pointed out my strengths going forward in order to use research to change practice and validate patient outcomes. Scholars have the potential to make a significant contribution to the evolution of changing nursing practice with EBPs and evaluate the outcomes. Furthermore, the DNP programs have open my eyes endlessly to the importance of creating and supporting an inter-professional relationship across disciplines through the scholarship of integration. The AACN (2006) explains that it is vital for scholars to collaborate with other disciplines in order to increase patient outcomes and expand EBPs. Likewise, the program has helped me to bridges a gap between nurse's knowledge, theory and practice resulting in better patient outcomes. Furthermore, this study has helped me understand data analysis and I am sure I will still be growing as I embark on the next phase of my nursing career. Also, I learned that dissemination of evidence and practice is vital as a DNP graduate. Dissemination not just internally or to a small community but nationally in order to elicit a change in practice and improve patient outcomes. Finally, the DNP program has assisted me in becoming a stronger advocate for healthcare policy and taking a leadership role in making health care changes to improve care and enhance nursing as a profession.

Analysis as a Practitioner

Advance practice nurses in the new millennium are considered to be DNP prepared nurses in order to help close the research-practice gap. Practitioners are trained to evaluate patients and outcomes, promote preventative measures and change practice. The DNP program enhances my skills as a practitioner with the translation of knowledge, how to critically appraise literature and evidence to help transform healthcare and close the huge research and practice gap while improving patient outcomes. The DNP

programs helped me connect the link from practitioner, a scholar to a developer in order to be able to be competent in organizational systems and leadership. It had also guided the direction of decreasing health disparities while enhancing preventative measures in the communities whether rural or urban. In addition, to increasing and developing stronger inter-professional collaboration team approaches to increase communication, improve patient care and help eliminate health care disparities (AACN, 2006). As well as, creating new healthcare models and applying it to practice.

Analysis as Project Developer

As a project developer the DNP programs has provided me with the ammunition to knowing how to evaluate evidence and implementing the best evidence into practice. It has help me identify and use a theoretical frameworks that can be applied to validate practice issues, design a research study and evaluate outcomes on a small scale that can be applied and implemented throughout the healthcare system. A developer must look at the overall organization structure, culture and cost that may be involved while getting on board all possible stakeholders from a variety of levels. As a developer the program has help me to look at ways in breaking down barriers in order to create an environment of sustainability while opening the lines of communication. The DNP essentials list twelve core competencies those competencies are what validate a competent developer, practitioner and scholar. The DNP program has opened my eyes to the importance of continuing my professional development in seeking certifications nationally; keep abreast on current EBPs and implementing them in the clinical setting. Nurses rely on each other to help engage other nurses in best practices, but as DNP graduate I will commit myself to higher level of practice, to nursing as a profession and to creating a better quality of

care with the intent to decreasing health disparities, advocate for the profession of nursing in the political arena and increasing patient positive outcomes.

What the Project Mean For Future Professional Development

The results of this research study have countless potential to be expanded throughout the healthcare organization in increasing nurse's knowledge of EBPs and its translation with ongoing support. Researchers have look at many ways to decrease CAUTI rates such as electronic reminders, changing devices, but has forgotten the fundamental approach to changing healthcare outcomes, testing and changing new EBPs, developing best practice guidelines and changing culture. That basic approach is to address, seek out and infuse nurses with evidence-based research knowledge to lead practice changes. This study can help expose the high demand for nurses to practice at the full extent of their education and training. Furthermore, translation of evidence-based guidelines and practices should start from undergraduate school to the clinical setting in order to decrease nurses' fear of research and keep them engaged to change non-EBPs with sound EBPs.

Summary and Conclusions

CAUTIs have been identified as one of the leading unnecessary HAIs occurring within healthcare organizations. Evidence is clearly documented through the literature that nurses are the frontline staff that plays a significant role on appropriate usage, care and management of IUCs. In order to prevent these never events nurses must be engaged in evidence-based research and practices that can help develop preventative care measures. The analysis of this study has determined that successful nurse driven indicators can produce positive outcomes by investing in ongoing nursing education. A

retrospective review of CAUTI rates were performed using a chi-square test to evaluate whether there was a significant difference in the CAUTI rates before and after the educational intervention. A statistically significant difference was found in the pre and post CAUTI rate (p <0.00). In addition, the Iowa model of EBP was found to be an effective theoretical framework in guiding this study.

Nursing leaders have a duty to ensure that nurses have the education and support to enhance patient care and provide up to date evidence in their clinical practice settings. Although, this study has shown an improvement in the medical surgical unit, CAUTI rates would benefit the organization to replicate this study with a larger sample size including the intensive care unit nurses. This will allow further examination of the nurse's baseline knowledge of CAUTI and perceptions of IUCs before and after an educational intervention. It is evident that EBP is being adopted and practiced by nursing, but more needs to be done to engage and translate the knowledge into practice. Polit and Beck (2006) stated that the achievement of evidence-based nursing practice depends on a research based body of knowledge. The results from this study will be important to healthcare organizations and contribute to a body of evidence, which in turn provides a foundation for clinical practice guidelines and clinical performance measures. Furthermore, there are some differences noted in the nurse's years of experience and age in the demographic characteristics a larger sample size can help identify variances throughout the organization which can help establish the educational needs of the nurses. Lastly, the results of this study can have a huge impact on changing practice at the bedside, maximize healthcare organization reimbursements, increase nurse satisfaction and increase the incidence of positive patient outcomes.

Section 5: Scholarly Product for Dissemination

Submitted for Publication

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Appendix A: Consent Form

You are invited to take part in a research study of an educational program to validate if educating nurses about appropriate usage, Foley/peri-care and use of the bladder scan wil help decrease catheter associated urinary tract infection in medical surgical patients. The researcher is inviting all staff nurses on the selected medical surgical unit to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

Background Information:
The purpose of this study is to determine if providing nurses with evidence based education regarding indwelling urinary catheters will decrease CAUTIs in medical surgical patients.

Procedures:
If you agree to be in this study, you will be asked to:

- Sign this consent form only once before the educational session begins
- Fill out a Demographic form prior to the educational intervention once
- Take 15 to 20 minute pre-test on catheter associated urinary tract infections once
- Sit in a one hour educational session on catheter associated urinary tract infections.
- Take a 15-20 minute posttest one month after the educational intervention

Voluntary Nature of the Study:
This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. No one at Grady Health System will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time.

Risks and Benefits of Being in the Study:
Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such as stress of taking a pre and posttest. Being in this study would not pose risk to your safety or wellbeing.

The benefits of this study are that staff nurses will gain additional knowledge or preventing catheter associated urinary tract infections.

Payment:
There are no rewards or payments for participating in this study.

Privacy:
Any information you provide will be kept confidential .The researcher will not use your personal information for any purposes outside of this research project. Also, the researcher will not include your name or anything else that could identify you in the study reports. Data will be kept secure by in a locked cabinet in the office of the CAUTI

nurse champion. Assess to the files will be limited to the researcher and CAUTI nurse champion. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via 404-616-9172 and/or pgordon@gmh.edu. If you want to talk privately about your rights as a participant, you can call Dr. Rosiland Harris who is Grady Health System Chair representative who can discuss this with you. Her phone number is 404-616-5805. The Research Oversight approval number for this study is _____ and IRB number is _____and expires on _____.

The researcher will give you a copy of this form to keep.

Statement of Consent:

I have read the above information and I feel I understand the study well enough to make a decision about my involvement. By signing below, I understand that I am agreeing to the terms described above.

Printed Name of Participant _____

Date of consent _____

Participant's Signature _____

Researcher's Signature _____

Appendix B: Demographic Form

All questions contained in this questionnaire area strictly confidential

Registered Professional Nurse	☐ Yes				
License Practical Nurse	☐ Yes				
How many years of experience do you have working as a nurse?	☐ 1-5	☐ 5-10	☐ 10-20	☐ 20-25	☐ 25+
Sex:	☐ Male	☐ Female	☐ Other		
Race/Ethnicity:	☐ Asian/Pacific Islander	☐ Hispanic/Latino			
	☐ African American	☐ Native/American			
	☐ White/Caucasian	☐ Others, specify			
What is the highest level of education you have completed?	☐ Associate degree				
	☐ Bachelor's degree				
	☐ Master's degree				
	☐ DNP				
	☐ Other make a categ				
What is your age?	☐ Under 20	☐ 20 - 29	☐ 30 – 39	☐ 40 -49	☐ 50 – 59	☐ 60 or older

Appendix C: Agenda

Preventing Catheter Urinary Tract Infections

Facilitator: Pamela Gordon MSN, RN

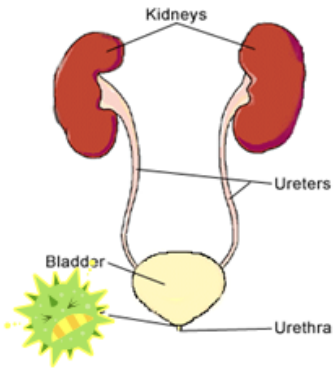
1/1/2013
0900-1030am

0900-0920	**Informed Consent Questions**	Unit Conference Room
0920-0935	**CAUTI Pre-test**	Unit Conference Room
0940-1020	**Educational Session: Preventing Catheter associated Urinary Tract Infections**	Unit Conference Room
1020-130	**[Wrap-up]** Q&A	Unit Conference Room

Appendix D: Educational & Recruitment Poster

WHY THE URINARY CATHETER?

HELP INCREASE THE QUALITY OF CARE TO YOUR PATINETS IN A RESEARCH STUDY ON YOUR UNIT



Urinary Catheters Increase:

- **Likelihood of Infection**
- **Patient Discomfort**
- **Antibiotic Use**
- **Length of Stay**
- **Cost**

** Patients with urinary catheters tend to stay in bed, making them more immobile, and increasing their risk of skin breakdown*

Urinary Catheters ARE Indicated for:

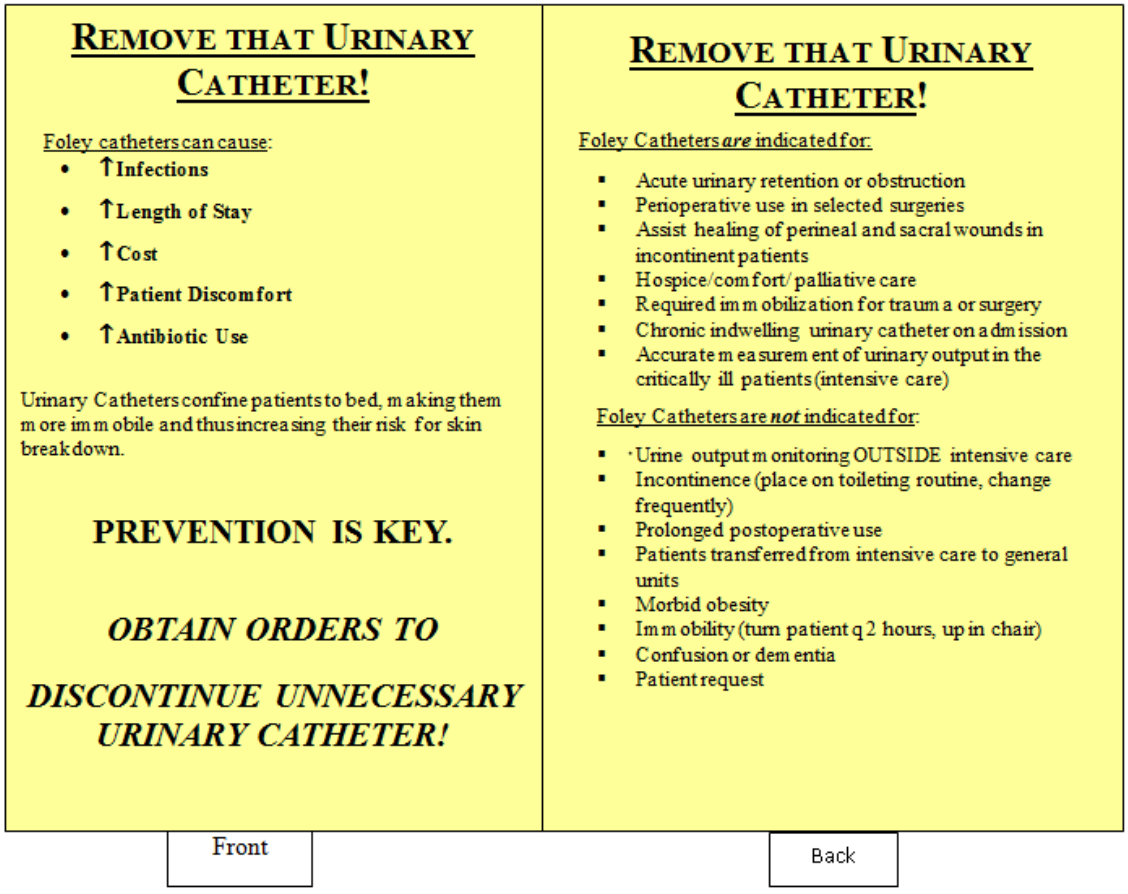
- ☑ Acute urinary retention or obstruction
- ☑ Perioperative use in selected surgeries
- ☑ Assist healing of perineal and sacral wounds in incontinent patients
- ☑ Hospice /comfort care/ palliative care
- ☑ Required immobilization for trauma or surgery
- ☑ Chronic indwelling urinary catheter on admission
- ☑ Accurate measurement of urinary output in the

Foley Catheters are *NOT* indicated for:

- ☒ Urine output monitoring OUTSIDE intensive care
- ☒ Incontinence (place on toileting routine, change frequently)
- ☒ Prolonged postoperative use
- ☒ Patients transferred from intensive care to general units
- ☒ Morbid obesity
- ☒ Immobility (turn patient q 2 hours, up in chair)
- ☒ Confusion or dementia

For Questions call
Pamela Gordon or Linda O'Sullivan @ 404 616 5394

Appendix E: Urinary Catheter Pocket Card



REMOVE THAT URINARY CATHETER!

Foley catheters can cause:

- ↑ **Infections**
- ↑ **Length of Stay**
- ↑ **Cost**
- ↑ **Patient Discomfort**
- ↑ **Antibiotic Use**

Urinary Catheters confine patients to bed, making them more immobile and thus increasing their risk for skin breakdown.

PREVENTION IS KEY.

OBTAIN ORDERS TO

DISCONTINUE UNNECESSARY URINARY CATHETER!

Front

REMOVE THAT URINARY CATHETER!

Foley Catheters ***are*** indicated for:

- Acute urinary retention or obstruction
- Perioperative use in selected surgeries
- Assist healing of perineal and sacral wounds in incontinent patients
- Hospice/comfort/palliative care
- Required immobilization for trauma or surgery
- Chronic indwelling urinary catheter on admission
- Accurate measurement of urinary output in the critically ill patients (intensive care)

Foley Catheters are ***not*** indicated for:

- Urine output monitoring OUTSIDE intensive care
- Incontinence (place on toileting routine, change frequently)
- Prolonged postoperative use
- Patients transferred from intensive care to general units
- Morbid obesity
- Immobility (turn patient q 2 hours, up in chair)
- Confusion or dementia
- Patient request

Back

Appendix F: Educational Session Power Point

Preventing Catheter Associated Urinary Tract Infections (CAUTI)

Pamela Gordon MSN, RN
Walden University DNP Student

1

Objective

- Review evidence that Foley catheters cause infection
- Apply guidelines for when to remove Foley catheter

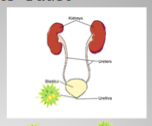
2

Urinary Tract Infection (UTI) and Indwelling urinary Catheters

- UTIs: **THE** most common Hospital Acquired Infection (HAI) and are directly associated with the use of indwelling Foley catheters
- 40% of all HAI are caused by UTI
- 80% are secondary to Foley catheters
- Risk of infection
  - ↑ 5% each day
  - ↑ 25% at 1 week
  - 100% at one month

3

Foley Catheter Cause



- ↑ Infections
- ↑ Length of stay
- ↑ Cost $$$
- ↑ Patient Discomfort ☹
- ↑ Antibiotic Usage
- ↑ Risk of falls (tethered to bed/1 point restraint)
- ↑ Risk of skin breakdown, DVT and pneumonia due to immobility

4

Benefits of Removing Unnecessary Foley Catheters

- Decrease in catheter-associated urinary tract infections (CAUTI)
- Improve patient safety
- Increase Nurses knowledge for the indications for urinary catheter use
- Reduction in the unnecessary use of urinary catheters

5

✓ Indications for Urinary Catheter:

- Acute urinary retention or obstruction
- Chronic indwelling urinary catheter on admission
- Hospice/Comfort/Palliative care
- Incontinence with perineal or sacral wounds.
- Accurate Intake and Output- (i.e. requiring Q 2 hour monitoring such as in ICU)
- Required immobilization for trauma or surgery
- Selected Surgeries and other reasons (determined by physician).

6

Shift Assessment

- Assess catheter for signs of infection.
- Assess appearance of urine for signs of bleeding or infection.

Reportable Conditions:

- Bleeding or signs of infection at urinary meatus.
- Resistance when attempting catheter removal.
- Patient is unable to void within 8 hours after catheter removal.

7

Urinary Catheters Are Not Indicated for:

- Intake/Output Outside Critical Care
- Incontinence Patients Transferred from Critical Care to General Units
- Prolonged Postoperative Use
- Morbid Obesity
- Immobility Without Pressure Ulcer
- Confusion/Dementia
- Patient Request

8

How does this apply to nursing?

- CAUTIs is a nurse driven indicator
- Nurses must advocate for the removal of unnecessary indwelling catheters.
- Use the criteria-based guidelines to determine need for Foley catheter.
- Document Foley criteria, insertion date, and discontinuation date.

9

Best Practice

- Sterile Insertion
- Sterile Closed System
- Catheter Care Twice Daily
- Maintain Collection Bag Below Bladder at Foot of Bed
- Proper Securement
- Do Foley/peri-care every four hours
- Review Daily: Is Catheter Necessary?
- Contact Physician If No Valid Reason For Catheter
- Remove All Urinary Catheters As Soon As Possible

10

Securement Device

- *StatLock® Securement devices are to be used when patients have a Foley catheter*

11

Prevention Bundle

1. Perform a ***daily review*** of the need for the urinary catheter.
2. Check the catheter for ***continuous connected*** to the drainage system.
3. ***Ensure patients are aware*** of their role in preventing urinary tract infection. (Alternative bundle criterion if the patient is unable to be made aware)
4. Perform routine daily Foley/per-care.

12

Prevention Bundle

6. Regularly ***empty urinary drainage bags as separate procedures***, each into a clean container
7. ***Completion***, remove gloves and perform hand hygiene again.
8. ***Perform hand hygiene*** and don gloves in preparation for procedure

13

Criteria for removal of Urinary Catheter:

FOR SURGICAL PATIENTS

- On or before postoperative Day 2, nurse must call MD for instructions whether to remove catheter or to leave it in place.
- Patients who have catheter past Postoperative Day 2 will need rationale documented by MD in medical record as part of the order for continuation of catheter.

14

Criteria for removal of Urinary Catheter:

FOR NON-SURGICAL PATIENTS

- Patient is now ambulatory
- Patient now presumed continent
- Patient has no perineal wounds
- Patient no longer requires frequent monitoring (i.e. Q2 hour monitoring of intake and output in ICU).
- Nursing Assessment/Judgment (Contact MD orders for removal)
- Remove catheter according to Lippincott's Nursing Procedure book

15

Documentation

- Indicate on flow sheet if catheter is necessary
- Document insertion/removal of catheter in nursing progress note and on flow sheet.
- Document time and amount of each time patient voids for the first 24 hours after catheter removal.

16

Recommendations

- Educate personnel in correct techniques of catheter insertion and care.
- Catheterize only when necessary.
- Emphasize hand washing.
- Insert catheter using aseptic technique and sterile equipment.
- Secure catheter properly.
- Maintain closed sterile drainage.
- Obtain urine samples aseptically.
- Maintain unobstructed urine flow.

17

Another Approach to CDC Guidelines

CDC guidelines can be implemented with an "ABCDE" approach,

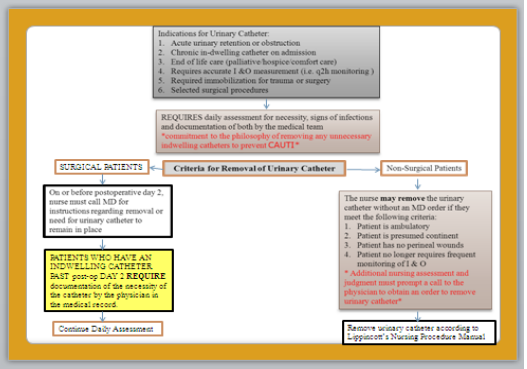
- *A:* is for **Adherence**: Adherence to infection control principles and activities such as hand hygiene, education and aseptic insertion technique.
- *B:* is for **Bladder ultrasound** to avoid placing an indwelling catheter unnecessarily.
- *C*: is for **Condom catheter** or some other type of intermittent catheterization in appropriate patients.

18

Another Approach to CDC Guidelines

- *D* is for **Do Not Use a catheter unless you must.** Dr. Saint states "That means avoiding indwelling catheterization especially in the emergency department."
- *E* is for **Early catheter removal** using nursing protocols, written or computerized reminders or stop orders.

19



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21

Questions

22

Appendix G: Foley Education Poster

Does your patient *really* need a Urinary Catheter?

CHECK OUT THE indications for URINARY CATHETER BELOW:

- Acute urinary retention or obstruction
- Perioperative use in selected surgeries
- Assist healing of perineal and sacral wounds in incontinent patients
- Hospice/ comfort care/ palliative care
- Required immobilization for trauma or surgery
- Chronic indwelling urinary catheter on admission
- Accurate measurement of urinary output in the critically ill patients (intensive care)

ANY QUESTIONS PLEASE CALL [Pamela Gordon or Linda O'Sullivan @ 404 616 5394

Appendix H: IUC Audit Form

Date: _____ Unit: _____ Auditor: _____

Please complete with (√) for compliant and (X) for non-compliant

Date of Admission	Unique Identifier Number (RCA1)	Number of Foley days	Securement in place and correct	Tubing free of loops or obstructions	Correct bag placement (Below Bladder/ Foot of bed)	Foley bag off the floor	Container not Over-filled	Foley/Peri Care done and documented	No Breaks in Catheter Seal	Order for Foley	Appropriate Necessity documented on LDA Flow sheet	Is the necessity supported by Documentation	Score x 10

Submit completed form to your Unit Nurse CAUTI Champion/ Pamela Gordon by the 2nd Friday of each month a total of 10 Audits

Appendix I: CDC Prevention Guidelines of CAUTI

I. Appropriate Urinary Catheter Use

A. Insert catheters only for appropriate indications (see Table 2 for guidance), and leave in place only as long as needed. **(Category IB)** (Key Questions 1B and 2C)

1. Minimize urinary catheter use and duration of use in all patients, particularly those at higher risk for CAUTI or mortality from catheterization such as women, the elderly, and patients with impaired immunity.**(Category IB)** (Key Questions 1B and 1C)
2. Avoid use of urinary catheters in patients and nursing home residents for management of incontinence. **(Category IB)** (Key Question 1A)

   a. Further research is needed on periodic (e.g., nighttime) use of external catheters (e.g., condom catheters) in incontinent patients or residents and the use of catheters to prevent skin breakdown. **(No recommendation/unresolved issue)** (Key Question 1A)

3. Use urinary catheters in operative patients only as necessary, rather than routinely. **(Category IB)** (Key Question 1A)

4. For operative patients who have an indication for an indwelling catheter, remove the catheter as soon as possible postoperatively, preferably within 24 hours, unless there are appropriate indications for continued use. **(Category IB)** (Key Questions 2A and 2C)

B. Consider using alternatives to indwelling urethral catheterization in selected patients when appropriate.

1. Consider using external catheters as an alternative to indwelling urethral catheters in cooperative male patients without urinary retention or bladder outlet obstruction. **(Category II)** (Key Question 2A)

2. Consider alternatives to chronic indwelling catheters, such as intermittent catheterization, in spinal cord injury patients. **(Category II)** (Key Question 1A)

3. Intermittent catheterization is preferable to indwelling urethral or suprapubic catheters in patients with bladder emptying dysfunction. **(Category II)** (Key Question 2A)

4. Consider intermittent catheterization in children with myelomeningocele and neurogenic bladder to reduce the risk of urinary tract deterioration. **(Category II)** (Key Question 1A)

5. Further research is needed on the benefit of using a urethral stent as an alternative to an indwelling catheter in selected patients with bladder outlet obstruction. **(No recommendation/unresolved issue)** (Key Question 1A)

6. Further research is needed on the risks and benefits of suprapubic catheters as an alternative to indwelling urethral catheters in selected patients requiring short- or long-term catheterization, particularly with respect to complications related to catheter insertion or the catheter site. **(No recommendation/unresolved issue)** (Key Question 2A)

II. Proper Techniques for Urinary Catheter Insertion

A. Perform hand hygiene immediately before and after insertion or any manipulation of the catheter device or site. **(Category IB)** (Key Question 2D)

B. Ensure that only properly trained persons (e.g., hospital personnel, family members, or patients themselves) who know the correct technique of aseptic catheter insertion and maintenance are given this responsibility. **(Category IB)** (Key Question 1B)

C. In the acute care hospital setting, insert urinary catheters using aseptic technique and sterile equipment. **(Category IB)**

1. Use sterile gloves, drape, sponges, an appropriate antiseptic or sterile solution for periurethral cleaning, and a single-use packet of lubricant jelly for insertion. **(Category IB)**
2. Routine use of antiseptic lubricants is not necessary. **(Category II)** (Key Question 2C)
3. Further research is needed on the use of antiseptic solutions vs. sterile water or saline for periurethral cleaning prior to catheter insertion. **(No recommendation/unresolved issue)** (Key Question 2C)

D. In the non-acute care setting, clean (i.e., non-sterile) technique for intermittent catheterization is an acceptable and more practical alternative to sterile technique for patients requiring chronic intermittent catheterization. **(Category IA)** (Key Question 2A)

1. Further research is needed on optimal cleaning and storage methods for catheters used for clean intermittent catheterization. **(No recommendation/unresolved issue)** (Key Question 2C)

E. Properly secure indwelling catheters after insertion to prevent movement and urethral traction. **(Category IB)**

F. Unless otherwise clinically indicated, consider using the smallest bore catheter possible, consistent with good drainage, to minimize bladder neck and urethral trauma. **(Category II)**

G. If intermittent catheterization is used, perform it at regular intervals to prevent bladder overdistension. **(Category IB)** (Key Question 2A)

H. Consider using a portable ultrasound device to assess urine volume in patients undergoing intermittent catheterization to assess urine volume and reduce unnecessary catheter insertions. **(Category II)** (Key Question 2C)

1. If ultrasound bladder scanners are used, ensure that indications for use are clearly stated, nursing staff are trained in their use, and equipment is adequately cleaned and disinfected in between patients. **(Category IB)**

III. Proper Techniques for Urinary Catheter Maintenance

A. Following aseptic insertion of the urinary catheter, maintain a closed drainage system **(Category IB)** (Key Question 1B and 2B)

1. If breaks in aseptic technique, disconnection, or leakage occur, replace the catheter and collecting system using aseptic technique and sterile equipment. **(Category IB)**

2. Consider using urinary catheter systems with preconnected, sealed catheter-tubing junctions. **(Category II)** (Key Question 2B)

B. Maintain unobstructed urine flow. **(Category IB)** (Key Questions 1B and 2D)

1. Keep the catheter and collecting tube free from kinking. **(Category IB)**

2. Keep the collecting bag below the level of the bladder at all times. Do not rest the bag on the floor. **(Category IB)**

3. Empty the collecting bag regularly using a separate, clean collecting container for each patient; avoid splashing, and prevent contact of the drainage spigot with the nonsterile collecting container. **(Category IB)**

C. Use Standard Precautions, including the use of gloves and gown as appropriate, during any
manipulation of the catheter or collecting system. **(Category IB)**

D. Complex urinary drainage systems (utilizing mechanisms for reducing bacterial entry such as
antiseptic-release cartridges in the drain port) are not necessary for routine use. **(Category II)** (Key Question 2B)

E. Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended. Rather, it is suggested to change catheters and drainage bags based on clinical indications such as infection, obstruction, or when the closed system is compromised. **(Category II)** (Key Question 2C)

F. Unless clinical indications exist (e.g., in patients with bacteriuria upon catheter removal post
urologic surgery), do not use systemic antimicrobials routinely to prevent CAUTI in patients requiring either short or long-term catheterization. **(Category IB)** (Key Question 2C)

1. Further research is needed on the use of urinary antiseptics (e.g., methenamine) to prevent UTI in patients requiring short-term catheterization. **(No recommendation/unresolved issue)** (Key Question 2C)

G. Do not clean the periurethral area with antiseptics to prevent CAUTI while the catheter is in place. Routine hygiene (e.g., cleansing of the meatal surface during daily bathing or showering) is appropriate. **(Category IB)** (Key Question 2C)

H. Unless obstruction is anticipated (e.g., as might occur with bleeding after prostatic or bladder surgery) bladder irrigation is not recommended. **(Category II)** (Key Question 2C)

1. If obstruction is anticipated, closed continuous irrigation is suggested to prevent obstruction. **(Category II)**

I. Routine irrigation of the bladder with antimicrobials is not recommended. **(Category II)** (Key Question 2C)

J. Routine instillation of antiseptic or antimicrobial solutions into urinary drainage bags is not recommended. **(Category II)** (Key Question 2C)

K. Clamping indwelling catheters prior to removal is not necessary. **(Category II)** (Key Question 2C)

L. Further research is needed on the use of bacterial interference (i.e., bladder inoculation with a nonpathogenic bacterial strain) to prevent UTI in patients requiring chronic urinary catheterization. **(No recommendation/unresolved issue)** (Key Question 2C)

Catheter Materials

M. If the CAUTI rate is not decreasing after implementing a comprehensive strategy to reduce rates of CAUTI, consider using antimicrobial/antiseptic-impregnated catheters. The comprehensive strategy should include, at a minimum, the high priority recommendations for urinary catheter use, aseptic insertion, and maintenance (see Section III. Implementation and Audit). **(Category IB)** (Key Question 2B)

1. Further research is needed on the effect of antimicrobial/antiseptic-impregnated catheters in reducing the risk of symptomatic UTI, their inclusion among the primary interventions, and the patient populations most likely to benefit from these catheters. **(No recommendation/unresolved issue)** (Key Question 2B)

N. Hydrophilic catheters might be preferable to standard catheters for patients requiring intermittent catheterization. **(Category II)** (Key Question 2B)

O. Silicone might be preferable to other catheter materials to reduce the risk of encrustation in

long-term catheterized patients who have frequent obstruction. **(Category II)** (Key Question 3)

P. Further research is needed to clarify the benefit of catheter valves in reducing the risk of
CAUTI and other urinary complications. **(No recommendation/unresolved issue)** (Key Question 2B)

Management of Obstruction

Q. If obstruction occurs and it is likely that the catheter material is contributing to obstruction,
change the catheter. **(Category IB)**

R. Further research is needed on the benefit of irrigating the catheter with acidifying solutions or
use of oral urease inhibitors in long-term catheterized patients who have frequent catheter obstruction. **(No recommendation/unresolved issue)** (Key Question 3)

S. Further research is needed on the use of a portable ultrasound device to evaluate for obstruction in patients with indwelling catheters and low urine output. **(No recommendation/unresolved issue)** (Key Question 2C)

T. Further research is needed on the use of methenamine to prevent encrustation in patients requiring chronic indwelling catheters who are at high risk for obstruction. **(No recommendation/unresolved issue)** (Key Question 2C)

Specimen Collection

U. Obtain urine samples aseptically. **(Category IB)**

1. If a small volume of fresh urine is needed for examination (i.e., urinalysis or culture), aspirate the urine from the needleless sampling port with a sterile syringe/cannula adapter after cleansing the port with a disinfectant. **(Category IB)**

2. Obtain large volumes of urine for special analyses (not culture) aseptically from the drainage bag. **(Category IB)**

Spatial Separation of Catheterized Patients

V. Further research is needed on the benefit of spatial separation of patients with urinary catheters to prevent transmission of pathogens colonizing urinary drainage systems. **(No recommendation/unresolved issue)** (Key Question 2D)

IV. Quality Improvement Programs

A. Implement quality improvement (QI) programs or strategies to enhance appropriate use of indwelling catheters and to reduce the risk of CAUTI based on a facility risk assessment. **(Category IB)** (Key Question 2D)

The purposes of QI programs should be: 1) to assure appropriate utilization of catheters 2) to identify and remove catheters that are no longer needed (e.g., daily review of their continued need) and 3) to ensure adherence to hand hygiene and proper care of catheters. Examples of programs that have been demonstrated to be effective include:

1. A system of alerts or reminders to identify all patients with urinary catheters and assess the need for continued catheterization.

2. Guidelines and protocols for nurse-directed removal of unnecessary urinary catheters

3. Education and performance feedback regarding appropriate use, hand hygiene, and
catheter care

4. Guidelines and algorithms for appropriate peri-operative catheter management, such as:

a. Procedure-specific guidelines for catheter placement and postoperative catheter
removal
b. Protocols for management of postoperative urinary retention, such as nurse-directed use of intermittent catheterization and use of bladder ultrasound scanners

V. Administrative Infrastructure

A. Provision of guidelines

1. Provide and implement evidence-based guidelines that address catheter use, insertion, and maintenance. **(Category IB)**

    a. Consider monitoring adherence to facility-based criteria for acceptable indications for indwelling urinary catheter use. **(Category II)**

B. Education and Training

1. Ensure that healthcare personnel and others who take care of catheters are given periodic in-service training regarding techniques and procedures for urinary catheter insertion, maintenance, and removal. Provide education about CAUTI, other complications of urinary catheterization, and alternatives to indwelling catheters. **(Category IB)**

2. When feasible, consider providing performance feedback to these personnel on what proportion of catheters they have placed meet facility-based criteria and other aspects related to catheter care and maintenance. **(Category II)**

C. Supplies

1. Ensure that supplies necessary for aseptic technique for catheter insertion are readily available. **(Category IB)**

D. System of documentation

1. Consider implementing a system for documenting the following in the patient record: indications for catheter insertion, date and time of catheter insertion, individual who inserted catheter, and date and time of catheter removal. **(Category II)**

a. Ensuring that documentation is accessible in the patient record and recorded in a standard format for data collection and quality improvement purposes is suggested. Electronic documentation that is searchable is preferable. **(Category II)**

E. Surveillance resources

1. If surveillance for CAUTI is performed, ensure that there are sufficient trained personnel and technology resources to support surveillance for urinary catheter use and outcomes. **(Category IB)**

VI. Surveillance

A. Consider surveillance for CAUTI when indicated by facility-based risk assessment. **(Category II)**

1. Identify the patient groups or units on which to conduct surveillance based on frequency of catheter use and potential risk of CAUTI.

B. Use standardized methodology for performing CAUTI surveillance. **(Category IB)**

1. Examples of metrics that should be used for CAUTI surveillance include:

a. Number of CAUTI per 1000 catheter-days
b. Number of bloodstream infections secondary to CAUTI per 1000 catheter-days
c. Catheter utilization ratio: (urinary catheter days/patient days) x 100

1. Use CDC/NHSN criteria for identifying patients who have symptomatic UTI (SUTI) (numerator data) (see NHSN Patient Safety Manual: http://www.cdc.gov/nhsn/library.html).

2. For more information on metrics, please see the U.S. Department of Health & Human Services (HHS) Action Plan to Prevent Healthcare-Associated Infections: http://www.hhs.gov/ophs/initiatives/hai/infection.html.

C. Routine screening of catheterized patients for asymptomatic bacteriuria (ASB) is not recommended. **(Category II)** (Key Question 2D)

D. When performing surveillance for CAUTI, consider providing regular (e.g., quarterly) feedback of unit-specific CAUTI rates to nursing staff and other appropriate clinical care staff. **(Category II)** (Key Question 2D)

Figure I: The Iowa Model of Evidence-Based Practice to Promote Quality of

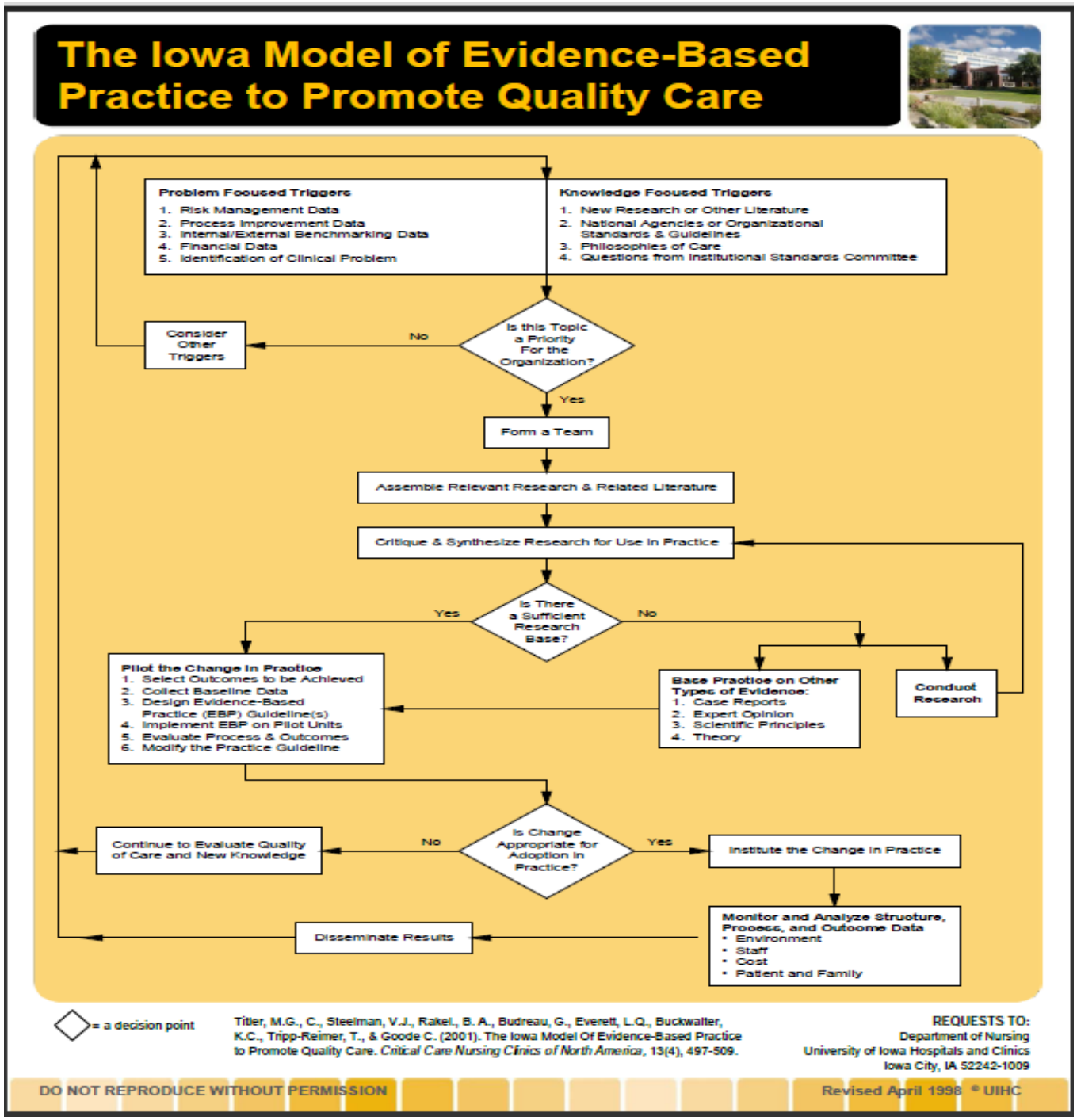
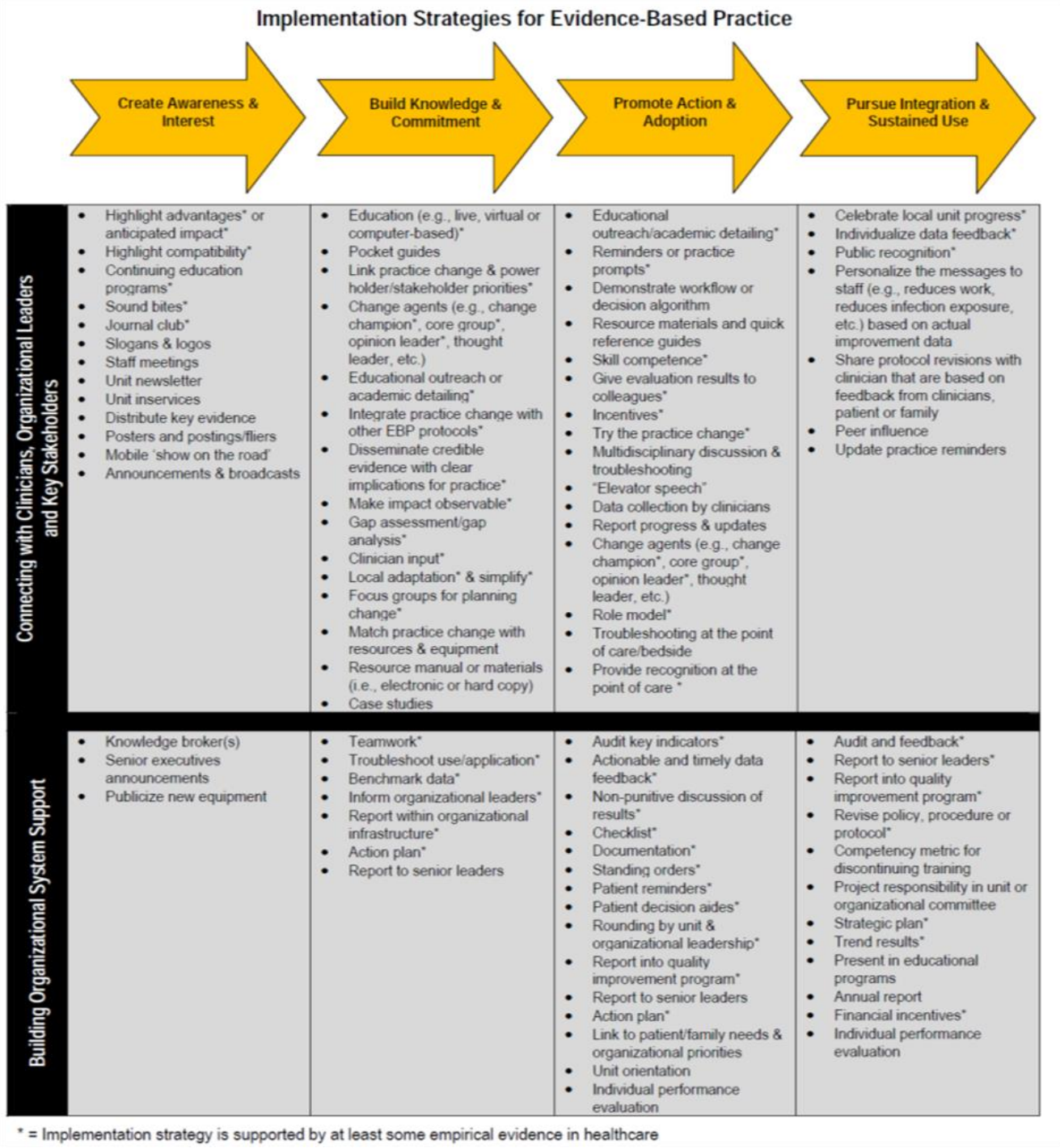


Figure II: Implementation Guide



Curriculum Vitae

Pamela Gordon MSN, RN, CPNP
600 Ruby Forest Parkway
Suwannee, Georgia 30024
Email to: pamela.gordon@waldenu.edu

Education

2012-2015 **Doctorate of Nursing Practice**
Walden University School of Health Science
Minnesota, Minneapolis

2002-2004 **Masters of Science in Nursing**
Rutgers State University- School of Nursing
Newark, New Jersey

1998-2000 **Bachelor of Science in Nursing**
College of New Rochelle- School of Nursing
New Rochelle, New York

1989-1991 **Associate Degree in Nursing,**
Cochran School of Nursing
Yonkers, New York

Professional Experience:

Grady Health System
1/2012-present

Advance Clinical Nurse Educator
Responsible Include:

- Interacts directly with patients and families to improve quality of life, improve patient outcomes, and promote health and well-being.
- Provides consultation to staff nurses, medical staff, and interdisciplinary colleagues, utilizing advanced nursing expertise, critical thinking, and problem-solving skills to optimize clinical outcomes.
- Manages change and empowers others to influence clinical practice and political processes both internal and external.
- Provides education and guidance to staff in order to advance the care of patient & families and to advance the practice of nursing

Grady Health System
1/2008-2012

Clinical Nurse Specialist/ Nurse Program Coordinator for HRSA Grant
Responsible Include:

- Develop and implement a Preceptor and Mentor Program.
- Serve as the liaison between Resident, Preceptor, and Mentor training programs
- Recruitment, education, and training of preceptor and mentor participants; the internal and external marketing activities; work closely with the consultant to learn and deliver mentor curriculum for the purpose of independence after year 3.
- Primary faculty educator for the Preceptor training program.
- Oversee data collection, analysis and evaluation activities and coordinating professional development credits through Georgia Nurses Association.

Newark Beth Israel Medical Center: Children's Hospital of New Jersey
2/2006-7/2007

Director, Patient Care Pediatrics,
Responsible Include:

- Assisting the Patient Care Service Executive Council in defining, planning, developing, implementing and evaluating the philosophy and objectives for Pediatrics to ensure the optimal delivery of care and services to all patients in an environment that promotes professional development
- Ensure that the medical staff while on the unit is compliant with standards of care, policies and procedures, quality and customer service initiatives.
- Establishing, enforcing, and evaluating structures, processes and outcome standards, policies/procedures, and services for the unit.
- Delivery of quality, compassionate, culturally competent, cost-effective and efficient care to individuals, families and communities served.
- Uses an understanding of growth and development to assess each patient's age specific needs and provide age specific treatment and care.
- Performs monthly reviews to determine if the appropriate percentage of the budget has been expended. Managerial financial statements are also prepared on a monthly basis along with weekly variance reports. These statements reflect budgeted revenues and expenditures, actual revenues and expenditures, and a comparison of prior year revenues and expenditures.
- Year-end reviews are conducted to identify any budgets that have been overspent.
- Work collaboratively with Physicians, Clinical Practitioners, and Senior Administrative Leadership.
- Collaborates with case managers and interdisciplinary team to ensure timely and appropriate discharge of patients.
- Maintain employee files and staff competencies
- Develop new strategies and materials for teaching and nursing improvement
- Develop and maintain patient satisfaction scores
- Interviewing and selecting, staff scheduling, performance appraisals and clinical support to staff.

- Increase staff moral and develop support programs for all staff members

Graduate PNP Internship
1/2004

- Morganville Pediatric Clinic: Morganville NJ: 185 hours of Primary care completed
- Quitman School healthcare Clinic: Newark New NJ: 185 hours of Primary care completed
- Hoboken Family Clinic: Hoboken, NJ: 185 hours of Women health care completed
- Pediatric Neurology Clinic at NYPH: 185 hours complete with Dr. Hossain

New York Presbyterian Cornell Medical Center, *Manhattan, NY*, 1/2000 -6/2005

RN CIS Instructor FT Days

- Training/teaching a variety of computerized applications to physicians, nurses, nurse assistance, administrative secretary and all ancillary staff.
    - PACS, Mysis, Imnet CISPLUS, chart review and Eclipsys SCM and SCC orders entry and documentation
    - Development of all user guides and instructors manuals.

New York Presbyterian Cornell Medical Center, *Manhattan, NY*, 11/1999 -10/2002

RN-Per-diem: Staff PICU, NICU and General Pediatrics

New York Presbyterian Cornell Medical Center, *Manhattan, NY*, **7/**1991-11/1999

Registered Nurse- FT Days & Nights

Pediatric Intensive Care Unit:

- Total patient care of critically ill children on a twenty-bed Pediatric Critical Care unit, involving a wide range of disease processes, including cardiac abnormalities, respiratory distress, oncology emergencies, trauma, neurological deficits, dialysis, immune deficiency related problems and pre/post operative management.
- Member of trained cardiac arrest team, responding to hospital-wide pediatric resuscitation using cardioversion and defibrillation when necessary.
- Functions interdependently with other health care professionals in the management of patient care including admission and discharge planning.
- Participate in the transport of critically ill-ventilated patients.

- Charge nurse responsible Include: assessing, delegating, evaluating staffing needs, schedules and coordinating daily operations.
- Member of unit based Patient Education, Quality Improvement and Communication committees.
- Preceptor to new staff and students in areas related to the objective practices and standards of nursing to ensure high nursing standards.

Awards received: 2001 Focoint Award, 1991 Mary C. Pryor Award, 1999 Honors Metal

Licenses and Certification

Pediatric Nurse Practitioner Certification, New York (**381747)**
RN License: New York **(438996)**
RN License: Georgia **(RN194180 GA)**
Basic Cardiac Life Support AHA (2010)
Basic Cardiac Life Support Instructor AHA (2011)
Pediatric Advance Life Support
Myers-Briggs Type Indicator **(2008)**

Professional Memberships

- National Association of Pediatric Nurse Practitioner (NAP/NAP)
- Heart Care International (HCI) – 2000 to Present. Member of the Cardiac Missionary Team
  HCI members travel to Third World Countries on a yearly basis to perform cardiac surgery on pediatric patients. All members of the team are volunteers.
- Organization of nurse Executive ONE NJ
- American Academy of Pediatric
- Sigma Theta Tau International Honor Society of Nursing
- Golden Key International Honor Society

Computer Skills

Microsoft Word, Windows, 95, 98, 2000, XP, Vista, WordPerfect, Internet, email, computerized charting, Kronos, Computerized physician order entry.

References furnished upon request