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Evaluation of a Difficult Urinary Catheter Team in an Academic Medical Center

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Walden University
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Abstract

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MSN, University of Tennessee, Knoxville, 1992

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Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

The placement of an indwelling urinary catheter (IUC) is a commonly performed clinical procedure which may become challenging for the clinician and painful for the patient. In response to urologic complications attributed to repeated failed IUC insertion attempts by nurses, a difficult urinary catheter (DUC) team program was launched in October 2012. The purpose of the doctoral project was to conduct a quality improvement evaluation of the effectiveness of the DUC team program using retrospective data from May 1, 2013 through May 31, 2017. Benner's novice to expert model was chosen as the theoretical framework to guide the additional training, critical thinking, problem-solving, and skill acquisition necessary for team member inclusion. The practice-focused question for the project answered whether DUC team nurses, through advanced training and demonstrated procedural competence, have been effective with DUC insertions. Sources of evidence included primary and secondary articles in peer-reviewed journals, as well as clinical evidence collected from internal sources. During the project time-line, 463 DUC team consultations were recorded with an insertion success rate of 89.6%. Based on the DUC team concept, additional didactic content and simulation training may be developed for other cognitive and skill-based clinical procedures. The implications for positive social change include improved patient safety and comfort, as well as cost savings for the organization and overall healthcare system.

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Dedication

This project is dedicated to my mother and other family members for their unconditional understanding of missed holidays and special occasions, as I struggled to balance my work and school commitments. Without their continued support and encouragement, my dream of a terminal degree in nursing would not have been realized.

.

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Section 1: Nature of the Project

The purpose of the doctor of nursing practice (DNP) project was to evaluate the effectiveness of an existing program in which a select group of registered nurses (RNs) had received additional training and expertise with the insertion of urinary catheters (UCs) in difficult scenarios. The formal difficult urinary catheter (DUC) team comprised RNs from three inpatient nursing units, the emergency department, and trained nursing supervisors who are available for consultation for UC insertion following two failed attempts by nursing colleagues, or for assessed patients with a DUC history or other predisposing conditions that could potentially lead to a DUC insertion.

From a professional perspective, nursing literature addressing DUC team concepts was minimal, and most published evidence related to physician training and approaches to DUC insertions. Depending on the project outcomes, the inclusion of DUC insertion techniques into standard procedural UC training for nurses may be warranted. The project may also provide an evidence-based clinical exemplar for other facilities to emulate. From a social perspective, the prevention of iatrogenic urethral injury and subsequent complications may improve patient safety and satisfaction, as well as enhance the public image of the facility within the larger community. From a financial perspective, a reduction in urethral and bladder complications related to UC insertion may result in overall cost savings for the patient, facility, and healthcare system.

Problem Statement

The DUC team program was launched in October 2012 in response to urologic complications attributed to repeated failed UC insertion attempts by nurses, cases of pre-

bladder UC balloon inflation, and concerns related to patient safety. The purpose of the project was to determine the effectiveness of DUC team implementation in relation to the number of DUC team consultations, number of urology consultations, percentage of successful DUC team insertions, and number of complications requiring surgical intervention.

UC insertion is a fundamental clinical nursing skill introduced during nursing education (Akhavizadegan, 2013; Cason, Atz, & Horton, 2017; Nathwani et al., 2017). Procedural insertion and competence with sterile technique may be evaluated in skills labs using high fidelity mannequins/models or on actual patients during clinical rotations (Todsen et al., 2013; Woods & Rosenberg, 2016). Prior training and experience are important predictors of insertion success and maintenance of patient safety (Manalo, Lapitan, & Buckley, 2011; Nathwani et al., 2017; Thomas, Giri, Meagher, & Creagh, 2009; Todsen et al., 2013; Wu, Blaschko, Garcia, McAninch, & Aaronson, 2012). Lack of adherence to proper insertion technique or lack of experience with potentially complex patient situations may lead to avoidable iatrogenic urethral injury, especially in male patients, as well as other complications such as urinary tract infections (UTIs) in both male and female patients (Wagner, Bird, & Coffield, 2016).

Compared to female patients, male patients may be more difficult to successfully insert a UC because of the length of the urethral anatomy, enlargement of the prostate gland, or other potentially obstructive conditions in the lower urinary tract such as fistulas, false passages, and strictures (Manalo et al., 2011; Palminteri et al., 2013; Standring, 2015; Villanueva & Hemstreet, 2011). Inserting a UC into a male patient

with blood at the urethral meatus, forcing the UC past the point of resistance, and prematurely inflating the balloon may cause injuries ranging from mucosal tears to more serious false passages (perforations), which are associated with urethral stricture formation and subsequent need for surgical repair (Villanueva & Hemstreet, 2011; Willette & Coffield, 2012). Repeated unsuccessful attempts not only increase the patient's anxiety and pain, but injury to the urethra may predispose the patient to infection and increased healthcare costs related to increased length of stay, additional procedures or interventions, and permanent damage to the urethra (Villanueva & Hemstreet, 2011; Wagner et al., 2016). In addition to increased patient discomfort and increased mortality, the cost of surgical repair for iatrogenic urethral trauma adds thousands of dollars to the overall hospital stay (Mori, 2014; Wagner et al., 2016).

Published literature regarding approaches for DUC insertions and recommended techniques is limited, creating a knowledge gap for practice. The journal articles currently available are authored by physicians and intended for physician audiences. Locally, the DUC team concept was introduced by an attending urologist and third-year urology resident following attendance at an annual urology conference. Following further discussion and planning, a RN DUC team was formed to address the increasing subjective complaints from urologists regarding patient harm and increasing consultations for UC placement. These consultations sometimes required surgical repair of urethral trauma caused by multiple unsuccessful UC insertion attempts by nursing staff. Prior to the project study, there had been no structured evaluation to determine the effectiveness of the DUC team.

Validation of the effectiveness of an RN driven DUC team and organizational protocol would further demonstrate the ability of nurses to use clinical knowledge, assessment, critical thinking, and clinical skills to promote patient safety and achieve positive outcomes. Benner's theoretical model of skill acquisition (Benner, 2001; Benner, Tanner, & Chesla, 2009) was used to illustrate how nurses can use advanced knowledge and skill acquisition to improve their practice, as they progress through five stages from novice to expert (McEwen & Wills, 2014).

In response to subjective concerns by urologists and costly complications related to multiple failed attempts by nursing staff to insert a routine UC, the DUC team concept was developed by a small multidisciplinary group of healthcare professionals (2 urologists, 2 clinical nurse specialists, and a chief nursing officer). A utilization report indicated three inpatient nursing units and the emergency department had the highest volume of UC insertions. To ensure UC insertion competency, a consensus recruitment decision was made to include only RNs with a minimum of 2 years of clinical experience and UC insertion skill levels of proficient or expert in the inaugural DUC team group (see Benner, 2001; Benner et al., 2009).

Because repetition and practice are considered important elements when developing expert-level critical thinking and clinical proficiency, managers of the highest volume UC insertion areas were approached for support of the DUC team concept and identification of potential nurses for inclusion. Contact information was collected and invitations containing program information, dates, times, and locations of the required training sessions were sent by e-mail.

Training content was collaboratively developed by stakeholders including urologists, clinical nurse specialists, nurse educators, and simulation center staff members. Topics related to general urological anatomy and pathophysiology, as well as selected case studies and decision-making scenarios were presented by both nursing and physician experts during interactive classroom presentations. High-fidelity mannequins and realistic urological models were used for skill practice and validation sessions. Live models were also available for practice with patient positioning during each skill session. Coaching and guided debriefing concluded each simulation session. Finally, observational opportunities with physician DUC experts were provided and encouraged. Following completion of all training requirements, successful members were presented with a DUC insertion team lapel pin (see Appendix E).

In 2012, 34 RNs with a range of clinical experience from 3 to 32 years (mean 11.3 years) attended and received required training. Over time, the team leader/relief team leader requirement was relaxed to include designated nursing unit staff RNs with 2 or more years of clinical nursing experience. At the time of this project study, a total of 94 RNs had completed initial DUC team training and participation in ongoing continuing education sessions. However, due to staff turnover, the availability of current DUC team members for consultation has remained consistently in the 30s.

The DUC insertion algorithm (see Appendix C), was developed as a standard guide for team members and was added, along with contact instructions, to the organizational indwelling urinary catheter policy. DUC team consultations are warranted when any patient has experienced two failed UC insertion attempts by RNs using a standard

kit/catheter or a previous documented patient history of DUC placement, radical prostatectomy or prostate surgery, urethral stenosis/stricture, pelvic radiation, difficulty visualizing the urethral orifice (female), meatal stenosis (male), hyper/hypospadias (male), or urological gynecologic pelvic surgery (female). If the DUC team member is unable to successfully insert an 18 Fr Coudé tip catheter or a 12 Fr silicone catheter following one attempt with each, a urology consult is initiated.

Purpose

Knowledge enhancement and continuing procedural skill acquisition by RNs can have a significant impact on patient outcomes (Benner et al., 2009; Cason et al., 2017; Gonzalez & Sole, 2014). Although considered a basic clinical skill, UC insertion can pose a challenge in certain patient populations. In some situations, a competent nurse with standard clinical knowledge and training, may be unable to successfully insert a UC. Because of the inability to think critically through the situational assessment, identify available resources, and problem solve, the nurse may be unable to execute the appropriate course of action. As a result, patient harm may occur, and a urology consult may be warranted. With the lack of published literature available to support DUC practice, the results of an objective outcome analysis would have implications for future nursing education and training in routine UC insertion. The purpose of the DNP project was to evaluate the effectiveness of an existing DUC team program in an academic medical center, utilizing the Walden University DNP Manual for Quality Improvement Evaluation Projects as a guide (Walden University, 2017).

The guiding practice-focused question for the doctoral project was the following: Have DUC team nurses, through advanced training and demonstrated procedural competence, been effective with DUC insertions? More specifically, what are the characteristics and incidence of complications for patients who received routine UC insertions compared with patients who received UC insertions by DUC team members? To answer the practice focused question, I identified the number of DUC consultations, number of urology consultations, percentage of successful RN DUC insertions, and incidence of iatrogenic urethral injuries requiring cystoscopy with irrigation and evacuation of obstructing clots and compared the findings with available literature whenever possible. Positive outcomes of the DUC team program may be significant for general knowledge, and the outcomes may be used for theory development or concept validation.

Nature of the Quality Improvement Evaluation Project

A clear distinction between quality improvement (QI) projects and research can sometimes be challenging (Ryan & Rosario, 2012). QI projects are generally: (a) based on existing knowledge with the intent of improving care, improving system processes, and/or enhancing patient satisfaction rather than creating new or generalizable knowledge; (b) focused on system processes unique to a specific institution or facility; and (c) support or reinforce resources necessary to maintain desired or improved outcomes (Stausmire, 2014). Additional distinguishing elements of QI projects include: (a) they do no impose risks beyond usual or customary care practices; (b) they use existing data, data collection tools, and analysis methods that may not have been

previously tested for validity and reliability; (c) they communicate findings within the local organizational or department settings; and (d) they may change practice immediately rather than requiring future studies to confirm or validate results (Ryan & Rosario, 2012; Stausmire, 2014). Although institutional review board (IRB) exemption or approval is not required for projects considered to be purely QI, editors and publishers of peer reviewed journals are increasingly likely to reject project manuscripts in which prior IRB exemption or approval had not been obtained to ensure ethical treatment and privacy protection (Chappy & Gaberson, 2012).

With assistance from a performance improvement (PI) coordinator and information technology (IT) database programmer, I collected data retrospectively from the electronic DUC team log and electronic medical records of patients with documented UC insertions. Additionally, I collected data for the procedural terminology (CPT) code 52001 (cystoscopy with irrigation and evacuation of multiple obstructing clots) and number of consultations over a predetermined time-frame from the urology department and health information systems (medical records) department. Following facility and Walden University IRB approval, I collected retrospective data on patients who had undergone indwelling UC insertion between May 1, 2013 and May 31, 2017. Demographic data included patient age, gender, time of UC insertion, number of DUC consultations, number of urology consultations, and number of complication occurrences (surgical intervention for iatrogenic urethral trauma).

I also conducted an extensive literature search to locate pertinent information. Relevant findings were incorporated into the DNP project and used for comparison

purpose whenever possible. Evaluation of the feasibility and effectiveness of an RN team for DUC insertions may indicate the viability of the program and continued resource utilization. Physicians routinely place orders for UC insertion for a variety of patient conditions. However, the UC size, design, or technique for insertion are often left to the nurse's training, available resources, previous experience, and/or discretion. The additional patient assessment considerations, problem-solving guidelines, and advanced procedural competence augment basic UC insertion training for all nurses.

Significance

The ability to safely and efficiently insert a DUC impacts patient, staff nurses (RNs), physicians (particularly urologists), and members of the infection prevention department, PI department, and medical center administration. Alleviation or minimization of patient discomfort may improve patient satisfaction, and the avoidance of unnecessary procedural complications may financially benefit the healthcare organization. Urologists may also benefit from decreased consultations for DUC placement. Staff nurses and patients may benefit by having additional resources available for DUC insertions. Outcomes from the DNP project may positively impact the viability of the DUC team program.

The theoretical foundation of nursing is strengthened when existing conceptual frameworks or models are used to illustrate or develop clinical nursing practice. Benner's novice to expert model (Benner, 2001; Benner et al., 2009) provides an effective means of understanding how nursing knowledge and clinical competence evolves sequentially over time. Advanced knowledge uptake, skill acquisition, and

previous experiences allow for the competent progression from basic nursing to expert clinician. I anticipated that Benner's model would exemplify enhanced professional growth and clinical development through the analysis of DUC team effectiveness. If the DUC team concept is determined to be effective, implications for translation to other nursing based cognitive and skill-dependent procedures (i.e., difficult IV insertions or difficult nasogastric tube placement) may be possible. Additionally, components of a successful RN DUC team may be transferrable to other healthcare organizations.

To improve care delivery and quality outcomes, new knowledge must be effectively translated and effectively implemented into clinical practice (White & Dudley-Brown, 2012). Implementation of a successful DUC team demonstrates efficient use of existing clinical resources and a potential means of effectively reducing healthcare cost through prevention of unreimbursed patient complications. Enhanced patient comfort and satisfaction with care delivery may result in a positive perception of the healthcare organization.

Summary

Urinary catheterization is a common procedure routinely performed by various healthcare professionals (Ghaffary, Yohannes, Villanueva, & Leslie, 2013). However, complex patient conditions and clinical situations may make UC insertion difficult for the clinician and painful for the patient. Lack of knowledge, inadequate training and experience, failure to follow infection prevention guidelines, and improper technique may result in serious complications and significant unreimbursed costs. Physicians routinely order UC insertions but seldom indicate specific UC size, type, or alternative techniques.

Nurses generally use standard UC kits and insertion skills, which may not be appropriate given a patient's unique presentation. However, patient comfort can be enhanced, and potential complications minimized when a standard approach to DUC insertion is followed (Villanueva & Hemstreet, 2011).

A preliminary literature search yielded a limited number of studies conducted by physicians regarding DUC insertion practice recommendations. There was an identified gap in evidence regarding support and direction for DUC insertion practice by nurses. The purpose of the DNP doctoral project was to evaluate the effectiveness of an existing RN DUC team. Specifically, I determined the percentage of successful UC insertions by the DUC team, number of DUC consultations, number of urology consultations, and number of surgical procedures to repair iatrogenic urethral trauma. Implications for practice and recommendations for further research were identified following analysis of project outcomes. Translation and implementation of new knowledge and best practices are most successful when an appropriate concept, framework, model, or theory is incorporated (White & Dudley-Brown, 2012). Benner's model of novice to expert (Benner, 2001; Benner et al., 2009) was chosen as the framework to describe and illustrate the DUC team concept and is discussed in the next section.

Section 2: Background and Context

The placement of an IUC is a relatively common procedure performed mostly by nurses, and approximately five million are inserted each year in the United States (Mori, 2014). However, because of specific preexisting conditions and comorbidities, some catheterizations may be challenging for the clinician and painful for the patient. Thomas et al. (2009) reported that 51 out of 864 urology consultations (6%) were the result of complications secondary to failed UC attempts. Iatrogenic urethral trauma, development of false passages, prostate injury (from inappropriate catheter balloon inflation), and catheter associated urinary tract infections (CAUTIs) are commonly reported complications of improper technique or incorrect catheter choice (Villanueva & Hemstreet, 2011).

Physicians routinely order IUC insertions but seldom indicate a specific UC size, type, or recommend technique. Nurses generally use available standard UC kits and learned insertion skills, but these may not be appropriate given a patient's unique presentation. Prior training and experience are important predictors of insertion success and maintenance of patient safety (Ghaffary et al., 2013; Manalo et al., 2011; Nathwani et al., 2016; Sullivan, Forde, Thomas, & Creagh, 2015; Thomas et al., 2009; Todsen et al., 2013; Villanueva & Hemstreet, 2011; Wagner et al., 2016; Willette & Coffield, 2012; Wu et al., 2012). Lack of adherence to proper insertion technique or lack of experience with potentially complex patient situations may lead to avoidable iatrogenic urethral injury (Ghaffary et al., 2013; Todsen et al., 2013; Villanueva & Hemstreet, 2011; Wagner et al., 2016).

Published literature regarding approaches for DUC insertions and recommended techniques is minimal, creating a knowledge gap for practice. At the time of this project study, journal articles were authored by physicians and intended for physician audiences. The formation of nursing DUC teams was mentioned in at least one published journal article (Villanueva & Hemstreet, 2011).

At the time of the study, the effectiveness of the DUC team in relation to the number of consultations, success of insertions, or reduction in the number of complications had not been evaluated. The practice-focused question for the doctoral project was the following: Have DUC team nurses, through advanced training and demonstrated procedural competence, been effective with DUC insertions? More specifically, what are the characteristics and incidence of complications for patients who received routine UC insertions compared with patients who received UC insertions by DUC team members? I hypothesized that the evaluation would show a significant number of DUC team consultations, a commendable insertion success rate, reduced incidence of complications, and overall cost savings for both patients and the organization.

Benner's novice to expert model (Benner, 2001; Benner et al., 2009) was chosen as the theoretical framework to guide the additional training, critical thinking/problem-solving, and skill acquisition necessary for RN DUC insertion team members. I anticipated that Benner's model, which is discussed in Section 2, would exemplify enhanced professional growth and clinical development through further analysis of DUC team effectiveness. In addition to Benner's model, I discuss the relevance of the project

to nursing practice, the project background, and the institutional context. I also describe the role of the DNP student and the project team.

Concepts, Models, and Theories

Like many other clinical procedures, UC insertion is an example of a measureable skill. Hand-eye coordination coupled with knowledge, practice, and feedback from previous opportunities affects the failure or success of the intended procedure. The psychomotor skills (creating/maintaining a sterile field and technique, dexterity, procedural familiarity) can be learned, practiced, and measured during formal classroom training sessions or in the simulation environment (Cason et al., 2017). According to Benner's model, the more repetitious the skill, the more likely the speed of uptake and skill level will improve (Altmann, 2007). In the context of a high-fidelity simulation training, Benner's model demonstrates the importance of psychomotor skill acquisition for the development of competency and expert-level achievement (Cason et al., 2017).

Benner's Novice to Expert Model

Benner's theoretical model, from novice to expert, was first published in 1984 (Alligood, 2014; McEwen & Wills, 2014). The model builds on the Dreyfus model of skill acquisition to better understand how skills are developed in clinical nursing practice (Alligood, 2014; McEwen & Wills, 2014). An assertion of the model is that "theory is derived from practice and that practice is extended by theory" (Alligood, 2014, p. 122). Knowledge is most important during the beginner or novice level of skill development because there are no background experiences or previous situational references to guide

decisions (Alligood, 2014). As the clinician begins to test and modify theory and expectations in actual scenarios, expertise develops.

Novice. In the novice stage of skill acquisition, sufficient background or prior experiences necessary for discernment between important or unimportant aspects of a particular situation are absent (Alligood, 2014; Payne, 2015). In some instances, nurses functioning at higher levels of skill in one particular area may revert to the novice level when placed in unfamiliar clinical situations.

Advanced beginner. The advanced beginner stage occurs when enough exposure to situations has become sufficient for meaningful components to become familiar and recognized (Alligood, 2014; Payne, 2015). However, there may be difficulty grasping the larger perspective, and the advanced beginner may remain rule guided and task oriented, relying on others with more experience for more complex decision making.

Competent. Through learning from actual practice situations in the novice stage, and by following the actions of others, the advanced beginner progresses to the competent level. The competent stage is pivotal because the discernment between elements that warrant attention are recognized and put into action (Alligood, 2014; Payne, 2015). New rules and reasoning are devised while applying learned rules for appropriate actions. Also, intuition is recognized as relevant (Alligood, 2014).

Proficient. As the competent stage progresses into the proficient stage, a new ability to view the changing relevance of situations and implement skilled responses to them has developed (Alligood, 2014; Payne, 2015). The whole of a situation is finally recognized, and actions or responses are linked with potential consequences.

Expert. At the fifth stage or expert level of skill acquisition, analytical principles or rules are no longer necessary to link understanding of a situation to an appropriate action (Alligood, 2014; Payne, 2015). An intuitive grasp of the situation allows for identification of the problem without wasting time considering a range of alternatives (Alligood, 2014; Payne, 2015). According to Payne (2015), expert nurses report a greater use of intuitive decision making.

The levels of skill acquisition and development occur sequentially along a continuum (Alligood, 2014; Altmann, 2007). However, regression to an earlier level may occur when a nurse is placed in an unfamiliar situation, or experiences an extended period of time in which the skill is not performed (Altmann, 2007). According to Benner's model, the preferred method of learning is by observation and modeling (English, 1993). Additionally, Benner theorized that skilled pattern recognition can be taught and will lead to more rapid progression through the five levels (Altmann, 2007). As nurse's progress from novice to expert, educational interventions should also progress (Payne, 2015). Clinical knowledge develops over time, and skill acquisition accelerates with repetition (Benner, 2001; Benner et al., 2009). Experienced nurses function at a higher level than novices, making fewer mistakes in decision-making, and demonstrate greater confidence with skill performance (English, 1993; Payne, 2015). Both experience and mastery of skills are necessary for skill progression to a higher level (Altmann, 2007).

A somewhat unconventional concept supported through Benner's model is that of intuition (Altmann, 2007; Payne, 2015). Expert nurses consistently report using intuition as a guide for decision making (Payne, 2015). The model suggests that judgment and

intuitive-decision making may be further developed through clinical education and training (Payne, 2015). This proposition would support continuing education and training through simulation, hands-on learning, case studies, and critical thinking exercises. Benner's model has sometimes been criticized for using qualitative research methodologies, especially regarding intuition development (Alligood, 2014; Altmann, 2007; Payne, 2015). However, as the nurse progresses through experiences, "clinical knowledge becomes a blend of practical and theoretical knowledge" which may be best demonstrated through qualitative means (Alligood, 2014, p. 123).

Relevance to Nursing Practice

As clinically skilled faculty and adequate clinical practicum sites become scarcer, curriculum-supported simulation-based training for basic procedural skills is becoming more prevalent. Literature has indicated that simulation-based training is an effective means of introducing and practicing skills for students without the threat of injury to patients or themselves (Cason, et al., 2017; Gonzalez & Sole, 2014; Nathwani et al., 2017; Woods & Rosenberg, 2016). Currently, nursing students gain clinical practice skills through a variety of experiences such as school based simulation centers, clinical patient care assignments, and clinical nursing unit rotations. However, the effectiveness of experiences is dependent on the clinical site/environment, experiences or interests of the nursing faculty or preceptor, and the student's motivation to learn and become proficient with clinical practice skills. Studies suggested that active and dynamic learning situations are preferred over passive methodologies and experiences (Cason et al., 2017; Gonzalez & Sole, 2014; Nathwani et al., 2017; Woods & Rosenberg, 2016).

Isolated simulation skill performance may not be adequate to ensure preparation for complex patient situations commonly seen in clinical practice. In some instances, simulated clinical decision-making is measured by analyzing procedural outcomes instead of the many factors that may change decisions before or during a procedure (Nathwani et al., 2017). Gonzalez and Sole (2014) suggested that one-time competency validation using simulation may not be sufficient to ensure long-term skill competence or retention. Additional training with interactive classroom presentations, case studies, critical decision-making scenarios, and simulated validation of skill competency may be a more comprehensive approach for adequately preparing RN DUC insertion team members.

Within the practicum site, intravenous (IV) catheter insertion proficiency has been enhanced by providing additional opportunities during the orientation time-frame. Newly graduated nurses are scheduled hours in high-volume IV insertion procedural areas within the organization. Informal evaluations of participants have indicated satisfaction with the experiences and self-reported improvement in both confidence and skill with performing the procedure. The DUC insertion team uses similar methods with the addition of anatomy/pathophysiology, critical decision-making sessions, and rationales for best practice.

As with other specialized team approaches, the additional training and skill acquisition may demonstrate improved success with RN DUC team insertions. Additionally, there may be a reduction in post-insertion complication rates (iatrogenic urethral/prostate repairs), a reduction in urologist consultations for DUC insertions, cost savings for

patients and organization, and a reduction in procedural discomfort for patients. Project success has the potential to strengthen approaches to assist RNs to acquire confidence and competence with other procedural skills through formalized focus and additional training.

Local Background and Context

Published literature is scarce regarding approaches to DUC insertions, and has primarily focused on medical interventions, not nursing considerations. A knowledge gap existed regarding nursing scope of practice and critical thinking/problem resolution approaches to DUC insertions. In response to costly complications following multiple failed attempts by nursing staff to insert a UC, 34 RNs, representing three high-volume UC insertion inpatient nursing units and the emergency department, were selected to receive additional training, and an RN DUC team was implemented in a Southeastern U.S. academic medical center in October 2012. Two published algorithms (see Appendix A and Appendix B) were reviewed and modified for nursing scope of practice and then used as an organized guide for DUC insertions (see Appendix C) (see Villanueva & Hemstreet, 2011; Willette & Coffield, 2012). The DUC algorithm and DUC insertion team contact process was then incorporated into the organizational UC policy.

Following the DUC algorithm, the DUC insertion team is consulted for any patient with a history of DUC placement, radical prostatectomy or prostate surgery, urethral stenosis/stricture, pelvic radiation, or if there is a presence of hyper/hypospadias, meatal stenosis in male patients, or difficulty visualizing the urethral meatus (opening) in either gender. Nursing staff should have no more than two unsuccessful attempts at UC

insertion before consulting the DUC insertion team. Unless the patient has lidocaine allergies, 10 milliliters of 2% lidocaine jelly is instilled in the male urethra at least 2-5 minutes prior to attempting UC insertion. DUC insertion team members will first attempt using an 18 Fr Coudé tip catheter if the male patient has a history of benign prostatic hyperplasia (BPH), or a 12 Fr silicone catheter if the male patient has a history of urethral stricture. Requesting additional assistance for proper positioning and lighting are important considerations for DUC insertions in females.

The project site was a fully accredited 581 bed Level I trauma and academic medical center with a four-year surgical residency program, located in the Southeastern United States. The facility is also recognized by the American Nurses Credentialing Center (ANCC) as a Magnet facility. Within the division of nursing, each nursing unit has a unit council, as well as a volunteer member for each of the larger system councils (research, practice, quality and safety, professional development, or recruitment and retention). Because of the adoption of the Magnet model and active participation by nurses, practice innovations and evidence-based practice initiatives are routinely introduced, supported, and evaluated for outcomes.

Healthcare acquired conditions not only have an effect on facility reimbursement, but also creates an additional burden for the patient both financially and physically. The existence of non-nursing DUC) teams was mentioned in at least one published journal article (see Villanueva & Hemstreet, 2011). However, published literature regarding approaches to DUC insertions from a nursing perspective remains elusive. At the time of

this project, there was no known DUC insertion teams affiliated with other healthcare facilities within the project home state or region.

Role of the DNP Student

My workplace facility was also my approved DNP practicum site. Since the initial DUC team implementation was considered an organizational performance improvement effort, a formalized scholarly approach to planning/development, implementation, evaluation, or dissemination of findings was overlooked. After approaching key administrators, it was determined that an evaluation of the effectiveness of the RN DUC insertion initiative would be a beneficial project. I then completed and submitted a prospectus for my DNP project and was approved to move forward with the application process.

Although not a conventional approach to scholarly work, I believe this project was a unique opportunity to move through an academic process, identify and refine issues, and further strengthen evidence-based practice (EBP) development within the organization. My learning experiences enhanced the potential to influence and strengthen the organizational nursing division's scientific rigor with future initiatives and to share new knowledge or best practices with professional colleagues.

Since I was involved with the history of the project, I feel confident that I was objective with interpreting the data analysis and reporting results whether positive or negative. Ultimately, the project outcomes impacted the sustainability of the RN DUC insertion team concept, as well as influencing transferability to other skill-based practice

issues. However, if no significant improvement in efficiency and effectiveness regarding patient outcomes was determined, then resources would be reallocated appropriately.

Role of the Project Team

There was not a formal project team. However, I relied on several individuals to supply information necessary for analysis and evaluation. These individuals were chosen because of their job roles and responsibilities. Upon receiving approval to move forward with data collection, I contacted key individuals in person or by e-mail with an explanation of the project details, specifics regarding the requested information, and a projected deadline for collection.

I anticipated having access to the information contained in the electronic DUC insertion team log book regarding demographic data and dates of DUC consultations. Only blinded or de-identified clinical data (age, gender, and date/time of insertion) was retrieved in the form of reports from the Cerner Millennium Power Chart platform, as well as other independent Microsoft Excel electronic spreadsheets. All reports contained only counts or numbers for statistical analysis/calculation purposes.

I contacted a health information department supervisor for patient information regarding ICD-10 surgical complication coding, and I contacted the urology department office manager for DUC urologist consultation information (CPT coding). Finally, I consulted a biostatistician from the graduate school of medicine regarding recommendations for data selection and assistance with data analysis. Once my proposal and IRB application was formally approved I developed a workable time-line. Since the

data was readily available, the timeline for collection, tabulation, and analysis proceeded relatively quickly.

Summary

Benner's model, from novice to expert, provides an effective illustration of how nursing knowledge and clinical competence evolves sequentially over time (Alligood, 2014; Benner, 2001; Benner et al., 2009). Advanced knowledge uptake, skill mastery, and previous experiences allow for a competent progression from basic nursing (novice) to expert clinician (Alligood, 2014; Benner et al., 2009). It is theorized that the findings from the evaluation project study would be favorable regarding the effectiveness of a RN DUC insertion team. Implementation of a successful RN DUC insertion team would demonstrate efficient use of existing clinical resources, as well as a potential means of effectively reducing healthcare cost through prevention of unreimbursed patient complications. The methods for study data collection, analysis, and synthesis will be discussed in the following section.

Section 3: Collection and Analysis of Evidence

UC insertion is a routinely performed and fundamental clinical nursing skill (Akhavizadegan, 2013; Cason et al, 2017; Nathwani et al., 2016). However, a lack of adherence to proper insertion technique or lack of experience with potentially complex patient situations may lead to avoidable iatrogenic urethral injury, especially in male patients, as well as other costly complications such as the need for surgical urethral repair, latent stricture formation, or the development of UTIs in both male and female patients (Wagner et al., 2016). The purpose of the DNP doctoral project was to evaluate the effectiveness of an existing program in which a select group of RNs had received additional training and expertise with the insertion of UCs in difficult scenarios.

Published literature was minimal regarding approaches to DUC insertions, primarily focusing on medical interventions and not nursing considerations. A knowledge gap existed regarding nursing scope of practice and critical thinking/problem resolution approaches to DUC insertions. In response to costly complications following multiple failed attempts by nursing staff to insert a UC, 34 RNs, representing three high-volume UC inpatient nursing units and the emergency department, were selected to receive additional training and a RN DUC team was implemented in a fully accredited 581-bed Southeastern U.S. Level I trauma and academic medical center. The facility is also recognized by the American Nurses Credentialing Center as a magnet facility and has a 4-year surgical residency program. Two published algorithms (see Appendix A and Appendix B) were reviewed and modified for nursing scope of practice (see Villanueva

& Hemstreet, 2011; Willette & Coffield, 2012). Appendix C includes the guidelines followed for RN DUC insertions.

Benner's, novice to expert model (Benner, 2001; Benner et al., 2009), was chosen as the theoretical framework to guide the additional training, critical thinking/problem solving, and skill acquisition necessary for RN DUC insertion team members. Psychomotor skills can be learned, practiced, and measured during formal classroom training sessions or in the simulation environment (Cason et al., 2017). In the context of high-fidelity simulation training, Benner's model demonstrates the importance of psychomotor skill acquisition for the development of competency and expert level problem solving skills (Cason et al., 2017).

A literature review provides a means of determining the extent to which a topic has been previously addressed, or identifying potential gaps in knowledge (Moran, Burson, & Conrad, 2017; Oerman & Hays, 2016; Terry, 2015). In addition to providing a description of what is already known, a comprehensive literature review also assists with confirming the extent to which new ideas or alternative perspectives may be warranted (Moran et al., 2017; Oerman & Hays, 2016; Terry, 2015). For the DNP project, the literature review assisted with the identification and understanding of best practices and new approaches for DUC insertions within the scope of nursing practice.

In the following subsections, I review the practice-focused question and sources of evidence from Sections 1 and 2. I also describe the literature search plan and study methods. Finally, I explain how data for the project were collected, analyzed, and synthesized.

Practice-Focused Question

In response to costly complications following multiple failed attempts by nursing staff to insert an UC, 34 RNs representing three high-volume UC inpatient nursing units and the emergency department were selected to receive additional training, and an RN DUC team was implemented in October 2012. Prior to this project study, the effectiveness of the team in relation to the number of consultations, success of DUC insertions, or the incidence of DUC specific complications had not been evaluated. Published literature regarding approaches for DUC insertions and recommended techniques was minimal, creating a knowledge gap for practice. The practice-focused question for the doctoral project was the following: Have DUC team nurses, through advanced training and demonstrated procedural competence, demonstrated clinical effectiveness? More specifically, what are the characteristics and incidence of complications for patients who received routine UC insertions compared with patients who received UC insertions by DUC team members?

The purpose of the DNP doctoral project was to analyze and evaluate the effectiveness of an existing program in which a select group of RNs had received additional training and expertise with the insertion of IUCs in difficult scenarios. The outcomes of the DNP project may positively impact the viability of the DUC team program.

Physicians routinely order UC insertions but seldom indicate a specific UC size, type, or recommended technique. Nurses generally use available standard UC kits that contain a sterile packaged 16 Fr or 18 Fr latex based straight tipped catheter, a preconnected urine collection bag, a prefilled 10 mL syringe for balloon inflation, a lubricant, a cleansing

solution, and one pair of sterile gloves. The standard kit and learned insertion skills may be inappropriate given a specific patient's unique presentation. For the purposes of the DNP project, DUC was defined as the inability of RNs to insert a urinary catheter following two attempts, a previous patient history of DUC, or other predisposing conditions that could potentially lead to a DUC insertion (Villanueva & Hemstreet, 2011).

Sources of Evidence

Because most of the published research has been found in medical journals, and has been authored by physicians for physician audiences, it was necessary to identify best physician practice recommendations and differentiate between techniques that require physician intervention and those within the scope of practice for RNs. It was important to discover evidence that supports the additional training and guidelines established for the RN DUC team, and that the procedures and techniques are EBP. Preliminary searches revealed limited published literature and relevant information related to DUC insertions by nurses.

Published Outcomes and Research

Sources of evidence were retrieved from primary articles found in published peer-reviewed journals. Secondary sources from published peer-reviewed journals were reviewed for content and considered for inclusion, as well as information retrieved from trusted Internet sources. The primary databases and search engines used for information discovery were the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Index Medicus (MEDLINE), ProQuest Nursing and Allied Health Source, and Google

Scholar. Search terms were selected from the doctoral project title. Specific keywords and combinations of terms included *urinary catheterization*, *difficult urinary catheterization*, *difficult catheter placement*, *catheterization team*, *urinary catheter insertion*, *urethral trauma*, *iatrogenic urethral injury*, *urethral injury*, *urinary catheter complications*, and *urinary catheter simulation*.

The initial CINAHL and MEDLINE Simultaneous Search, included the general term urinary catheterization. The search was restricted to full text, English language, available references, and scholarly (peer reviewed) journals from January 2009 to September 2017. Similar searches were conducted using ProQuest Nursing and Allied Health Source and Google Scholar. Other search strategies included trusted databases and Internet sources as determined by the amount and scope of information discovered. To conduct a comprehensive search, I requested librarian assistance from the Walden University library, as well as an academic medical center library.

Archival and Operational Data

Evaluation consisted of retrospective electronic data from May 1, 2013 through May 31, 2017 retrieved from the organizational electronic DUC log. Comparative information regarding complications (endoscopic urologic repairs) was obtained from the health information systems department (ICD-10 codes). Finally, the number of urology consultations was obtained from the practice manager for the same time-frame (CPT coding). To evaluate the effectiveness of the RN DUC team, comparative data were necessary for statistical analysis and evaluation of DUC team effectiveness. Overall

DUC consultations, DUC insertion success, complications (incidence of iatrogenic trauma requiring surgical repair), and urology consultations were analyzed.

Data related to healthcare acquired conditions are routinely collected, analyzed, and reported by personnel of the organizational performance improvement, information technology, and infection prevention departments. These data also included information related to procedures (DUC and surgical urethral repairs), as well as the incidence of infections (CAUTIs). Urology consultations for DUC insertions are electronically coded (CPT codes) and recorded by the urology department practice manager for billing purposes. The information is readily available and can be electronically tabulated upon request. All patient identification is blinded or de-identified with only reports or numbered counts provided from the databases.

Following IRB approval, I requested data from the appropriate sources. As an employee of the organization, I had administrative access. However, the nature of the DNP project was made explicit, an application for facility IRB approval was submitted, and additional permissions for data access were secured prior to data collection.

Evidence Generated for the Doctoral Project

According to Chappy and Gaberson (2012), many peer-reviewed journals will not accept manuscripts in which IRB approval was not obtained. IRB approval is necessary to ensure all participants are treated ethically and that personal health information (PHI) is protected (Chappy & Gaberson, 2012; Grove, Burns, & Gray, 2013; Kano, Getrich, Romney, Sussman, & Williams, 2015). Following the guidelines in the Walden University Manual for Quality Improvement Evaluation Projects (Walden University,

2017), I ensured that all academic and facility policies were followed, organizational names and locations were masked, and de-identified PHI was collected from existing databases. Because no apparent participant or facility risks existed, preapproval and/or IRB exemption status from Walden University and the practicum facility was requested and received prior to data collection (see Grove et al., 2013; Walden University, 2017). Electronic medical record information and PHI obtained from databases were password protected and number coded when possible. All documents containing identifiable information was stored and locked in a secure office. Data will be erased or shredded 5 years after completion of the project.

Analysis and Synthesis

The DNP project included a retrospective cohort study design. Blinded or de-identified data were retrieved, in the form of counts or numbers, from the facility's Cerner Millennium platform, Power Chart, and other independent Microsoft Excel electronic spreadsheets. Statistical analysis involving appropriate inferential statistical methods was conducted with IBM SPSS software. A PhD prepared biostatistician was consulted prior to data collection and assisted with data analysis. Data cleaning was completed for each variable to check for numerical coding errors, as well as inconsistent or missing data.

Summary

UC insertion is a common clinical procedure performed primarily by RNs. In response to costly complications following multiple failed attempts at UC insertion by nursing staff, a RN DUC team was developed and implemented in a Southeastern U.S.

academic medical center in October 2012. At the time of the project study, outcomes of the DUC team in relation to the number of consultations, success of DUC insertions, or complications (iatrogenic urethral trauma), had yet to be evaluated. The purpose of the DNP doctoral project was to evaluate the effectiveness of an existing RN DUC insertion team.

To establish evidence-based standards for the existing DUC team training content, insertion techniques, and practice guidelines, I conducted a comprehensive literature review including reputable databases and Internet resources. Following IRB approval, organizational data were collected, analyzed, and synthesized to determine the effectiveness of DUC team interventions. Project findings and recommendations are presented in Section 4.

Section 4: Findings and Recommendations

According to the Centers for Disease Control and Prevention (CDC, 2018), 12%-16% of all admitted adults will have an indwelling urinary catheter inserted at some time during their inpatient stay. However, lack of knowledge, inadequate training and experience, failure to follow infection prevention guidelines, and improper technique may make this common clinical procedure challenging for the clinician and a serious health risk for the patient (Manalo et al., 2011; Nathwani et al., 2017; Thomas et al., 2009; Todsen et al., 2013; Wagner et al., 2016; Wu et al., 2012). Iatrogenic urethral injuries and subsequent complications are believed to be preventable when well-trained care providers are used for UC insertions (Sullivan et al., 2015; Todsen et al., 2013).

In a study conducted by Leuck et al. (2012), 32 (32%) of 100 instances of urinary catheter associated genitourinary trauma in male patients required advanced procedures such as cystoscopy to resolve incurred complications. Thomas et al., (2009) reported that 6% of urology consultations were the direct result of complications secondary to failed UC attempts. Villanueva and Hemstreet (2011) defined DUC as a patient history consistent with previous or suggestive of possible difficulty with urinary catheterization, failure to insert a standard urinary catheter following two or more unsuccessful attempts, or visual blood at the urinary meatus. Because the Centers for Medicare and Medicaid Services no longer reimburse hospitals for the additional cost of treatment for healthcare acquired conditions, it is essential that healthcare organizations maximize cost reduction efforts and improve processes that promote efficient resource utilization, as well as achieve positive patient outcomes (Kennedy, Greene, & Saint, 2013).

In response to instances of urological complications attributed to repeated failed UC insertion attempts by nurses, cases of pre-bladder UC balloon inflation, and concerns for patient safety, a RN DUC team program was launched at the practicum facility in October 2012. The inaugural DUC team consisted of 34 RNs with a range of clinical experience from 3 to 32 years (mean 11.3 years) who received additional education, training, and competency validation. At the time of the study, a total of 94 RNs had completed initial DUC team training and participation with ongoing continuing education sessions. However, due to staff turnover, the availability of current DUC team members for consultation has remained consistently in the 30s.

Published literature regarding approaches for DUC insertions and recommended techniques was minimal, creating a knowledge gap for practice. The journal articles available at the time of the study were authored by physicians and intended for physician audiences. However, the formation of non-nursing DUC teams was mentioned in at least one published journal article (Villanueva & Hemstreet, 2011).

Benner's theoretical model of skill acquisition (Benner, 2001; Benner et al., 2009) was the chosen framework to illustrate how nurses use advanced knowledge and skill acquisition to improve their practice as they competently progress through five stages from novice to expert (McEwen & Wills, 2014). The practice-focused question for the project was the following: Have DUC team nurses, through advanced training and demonstrated procedural competence, been effective with DUC insertions? More specifically, what are the characteristics and incidence of complications for patients who received routine UC insertions compared with patients who received UC insertions by

DUC team members? The purpose of the DNP doctoral project was to evaluate the effectiveness of an existing DUC team program in a Southeastern U.S. academic medical and Level I trauma center. I followed the Walden University DNP Manual for Quality Improvement (Walden University, 2017) when conducting the study.

Sources of evidence were retrieved from primary articles in peer-reviewed journals. I used the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Index Medicus (MEDLINE), ProQuest Nursing and Allied Health Source, and Google Scholar. Secondary sources from published peer-reviewed journals were also reviewed for content and considered for inclusion, as well as information retrieved from other trusted Internet sources. To ensure comprehensiveness of the literature search, I requested assistance from Walden University and practicum site medical librarians.

Following both practicum site and Walden University IRB approval, I collected clinical site data from May 1, 2013 through May 31, 2017 from the organizational electronic DUC insertion team log, Cerner Millennium Power Chart platform, and Microsoft Excel spreadsheets. Demographic data (age, gender, and date/time of UC insertion/consultation) were received as reports with only counts or numbers with no identifying patient information. Retrospective data for the CPT code 52001 (cystoscopy with irrigation and evacuation of multiple obstructing clots) and number of consultations during the project timeframe were retrieved from the urology department office manager in the form of an Excel spreadsheet. Received data reports were discussed and clarified with those providing the information, and 2 PhD biostatisticians from the practicum site graduate school of medicine were consulted to assist with data analysis, cleaning, and

interpretation using Microsoft Excel technology, as well as SPSS Statistics Version 22 when appropriate. The primary evaluation outcomes were analyzed using comparative counts, averages, and cross tabulations.

Findings and Implications

DUC Team Utilization and Project Demographics

During the project timeline (May 1, 2013 to May 31, 2017), 19,816 IUCs were inserted within the inpatient and outpatient areas. Of those insertions, 10,219 (52%) were for male patients with an age range of 16 to 98 years (average 65 years). There were 9,597 (48%) IUC insertions for female patients with an age range of 15 to 106 years (average 67 years). During the same timeline, the DUC team logged 463 consultations with an overall insertion success rate of 89.6%. Of the DUC team consultations, 291 (63%) were for male patients (age range 16 to 98 years) with an average age of 64 years, and 172 (37%) were for female patients with an average age of 70 years (age range 20 to 102 years). Finally, there were 198 urology consultations reported with 163 (82%) for male patients with an age range of 20 to 90 years (average 72 years) and 35 urology consultations for female patients with an average age of 69 years (range of 56 to 83 years). Of the total reported urology consultations, 55 included CPT code 52001, indicating more advanced instrumentation was necessary for diagnosis and/or repair of iatrogenic urethral or prostate injuries. Additionally, the higher percentage of male patients in both the DUC (63%) and urology (82%) consultation populations was consistent with findings from the literature indicating that men may be more difficult to

catheterize than women (Wagner et al., 2016). Table 1 provides an overview of the IUC insertion activity during the project time frame.

Table 1

Practicum Site UC Insertion Activity (May 1, 2013 through May 31, 2017)

IUC insertions	Total	Time 7a-7p	Time 7p-7a	Male	Avg. Age	Female	Avg. Age
Organization	19,816	57%	43%	52%	65	48%	67
DUC team	463	62%	38%	63%	64	37%	70
Urology dept.	198	Unavailable	Unavailable	82%	72	18%	69

DUC Insertion Success

Because of the lack of comparable benchmarking data, existing literature was used to determine the relevance or significance of the project findings. Villanueva and Hemstreet (2011) reported that approximately 1.4% of catheters placed during their study period had catheter-related trauma. As high as 6% of the urology consultations required surgical interventions to resolve complications resulting from unsuccessful IUC insertion attempts. When comparing the DUC team and urology consultations for two or more failed insertions or approved patient history indications, there was a statistically significant difference between the expected 6% and the observed 2.3% difficult IUC insertions ($p < 0.001$). Possible explanations might be that the practicum site IUC population was less difficult than the population reported in the literature or the overall insertion success at the practicum facility was better than expected (requiring fewer DUC consultations). Out of the reported 198 (0.9%) urology consultations during the project time-line, 55 (27.7%) required surgical intervention related to insertion complications which was lower than the 32.8% reported in the literature (Villanueva & Hemstreet,

2011). Finally, the RN DUC team's 89.6% insertion success rate approached the 95% Foley team placement success reported by Villanueva and Hemstreet (2011). For the practicum site urologists, this resulted in approximately 417 fewer consultations, which was both acceptable and welcomed.

CAUTIs

According to the CDC (2018), 12% to 16% of adults admitted to hospitals will have an IUC inserted at some time during their hospitalization for therapeutic treatment and/or procedures. Although there are many variables that may increase the risk of developing a CAUTI, each day the catheter remains in place, the risk increases by 3% to 7% (CDC, 2017, 2018; Gokula et al., 2012; Gould, Umscheid, Agarwal, Kuntz, & Pegues, 2017; Institute for Healthcare Improvement, 2011; Leuck et al., 2012; Lo et al., 2014; Mori, 2014; Palmer, Lee, Dutta-Linn, Wroe, & Hartmann, 2013; Pashnik, Creta, & Alberti, 2017; Quinn, 2015; Rebmann & Greene, 2010). As with many evidence-based recommendations, there are multiple and often complex factors associated with reducing the incidence of CAUTIs. According to the literature, the implementation of bundled interventions have been more successful than individual components introduced individually (American Board of Internal Medicine, 2013; CDC, 2018; Gokula et al., 2012; Gould et al., 2017; Institute for Healthcare Improvement, 2011; Lo et al., 2014; Rebmann & Greene, 2010).

Components of a robust CAUTI prevention bundle include: (a) consideration and use of alternatives, preventing the insertion of IUCs when possible; (b) following evidence-based and facility-approved indications for IUC insertions; (c) ensuring aseptic technique

is strictly followed and only well-trained clinicians perform IUC insertions; (d) ensuring that strict evidence-based maintenance guidelines are followed; (e) monitoring dwell time and removing the IUC as soon as possible; (f) ensuring that administrative structures are in place to support CAUTI reduction efforts at all organizational levels; and (g) developing and implementing outcome-driven surveillance strategies (CDC, 2018; Gonzalez & Sole, 2014; Gould et al., 2017; Kilgore, 2017; Lo et al., 2014; Quinn, 2015; Rebmann & Greene, 2010; Sullivan et al., 2015; Todsen et al., 2013). Because length of dwell time is considered to be one of the most important risk factors related to CAUTI development, nurse-driven removal protocols have been reported to be a successful and key aspect of CAUTI reduction efforts (Gokula et al., 2012; Kilgore, 2017; Mori, 2014; Pashnik et al., 2017; Quinn, 2015).

Standardized reporting of CAUTI incidence to regulatory and benchmarking agencies is performed by the practicum facility's infection prevention department. For both internal and external data reporting, the CAUTI rate per 1,000 urinary catheter days is calculated by dividing the number of CAUTIs by the number of catheter days and multiplying by 1,000 (CDC, 2018). In response to the availability of recently published evidence-based recommendations and guidelines, the RN DUC team, CAUTI reduction bundle (IUC need assessment, insertion, maintenance, urine specimen collection, and removal guidelines), and a nurse-driven IUC removal protocol were simultaneously introduced in October 2012. Although a single factor cannot be separated as being responsible, the combined multidisciplinary and multifactorial strategies has resulted in a significant decline (85.8%) in the incidence of CAUTIs at the practicum facility from 198

in 2011 to 28 in 2017. The RN DUC team has impacted organizational efforts at the insertion portion of the reduction bundle. When cross-referenced, only two patients were identified in both the CAUTI report and the DUC team consultation log. Figure 1 (actual reported CAUTI numbers by year) and Figure 2 (average CAUTI rate per 1,000 catheter days) depict the organizational CAUTI reduction over the project timeline.

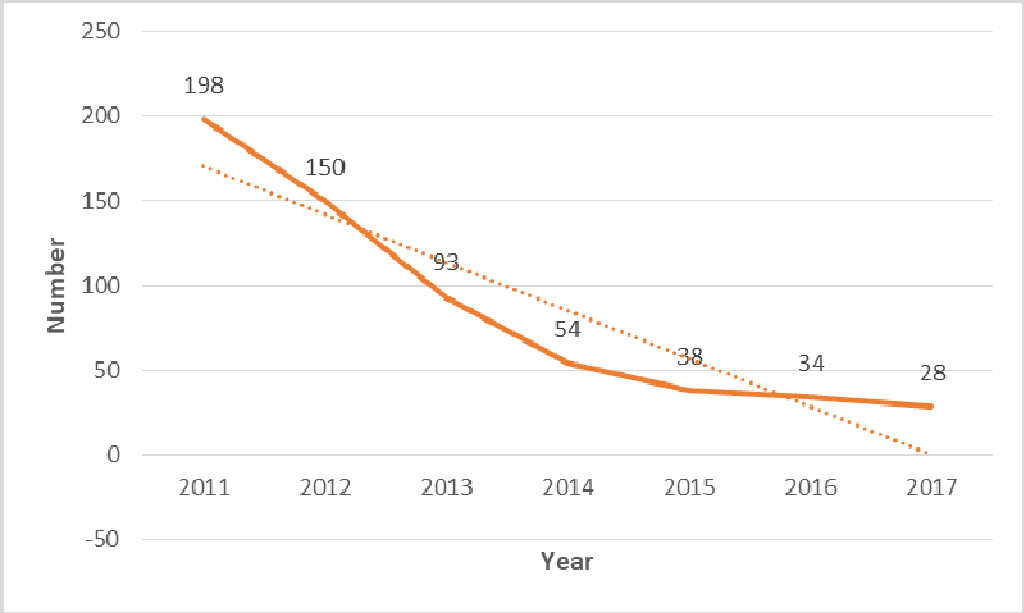

Figure 1. Actual reported CAUTI numbers by year.

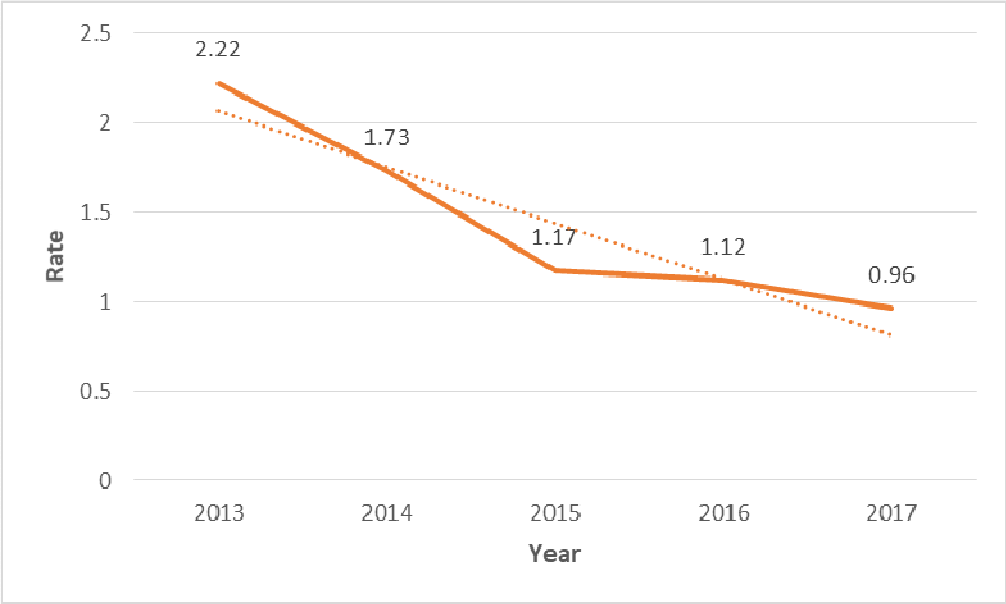

Figure 2. Average CAUTI rate per 1,000 catheter days.

Complications and Cost Reduction

As attention continues to focus on improving quality of care and maximizing patient safety, both governing agencies and commercial payers are seeking to link reimbursement to pay-for-performance and measurement outcomes (Palmer et al., 2013). Since 2008, the Centers for Medicare and Medicaid Services no longer reimburses healthcare facilities for the additional cost of complications incurred during hospitalization (Institute for Healthcare Improvement, 2011). Complications such as iatrogenic urethral trauma, prostate injuries, and CAUTIs are considered to be relatively preventable high-cost and high-volume conditions resulting in increased length of stay and cost of treatment/repair. Additionally, healthcare acquired conditions not only have

an effect on facility reimbursement, but they also have the potential to create an additional psychological, physical, and financial burden for the patient.

According to Rappleye (2015), the average daily charge for an inpatient stay in a nonprofit hospital in the practicum site state was $1,880 in 2013 and a single episode of CAUTI may increase the length of stay by one half to one full additional day (Institute for Healthcare Improvement, 2011). The average cost for a cystoscopy with irrigation, evacuation of multiple obstructing clots, and urethral repair at the practicum facility is approximately $6,000. Finally, many literature sources report the mortality rate for a CAUTI as approximately 10% and the additional cost per case for treatment ranging from $700 to $2,700, depending upon the type and length of antibiotic therapy and/or development of bacteremia (Rebmann & Greene, 2010; Villanueva & Hemstreet, 2011; and Wagner et al., 2016).

Although difficult to establish a direct measurement, it is generally thought that the RN DUC team has contributed indirectly with cost saving for the organization through reduction in the incidence of CAUTIs (81.3% during the project time-frame). Only two (0.5%) of the recorded DUC team IUC insertions were cross-referenced with patients who developed CAUTIs during the project time-frame (397). Further, from the reports acquired for the project, it is unclear if the two CAUTIs were the result of compromised insertion or acquired during maintenance of the IUC. It is also probable that the DUC team has contributed to reducing patient harm/discomfort, the additional cost of repairing iatrogenic urethral injuries, and the additional length of stay as evidenced by the 89.6% insertion success rate. Finally, the RN DUC team is a voluntary program in which no

additional staffing costs are incurred by the organization. Consultations are answered during previously scheduled work assignments and/or unit based patient care assignments.

An unanticipated limitation during data analysis was the inability to cross reference the DUC team data with the CPT billing data obtained from the urology department. The patient record numbers from the two sources were not generated from the same system and would have required labor intensive chart reviews and manual data comparison. Additionally, to match the information, patient identification would have been necessary and beyond the project IRB approval. This limitation prevented the ability to match and/or count patients who may have received a DUC team consultation and subsequently required more advanced or surgical procedure to place the UC. Finally, the inability to abstract DUC team data directly from the main Cerner Millennium electronic health record (EHR) system would also be a possible limitation. The DUC team log data was voluntarily entered by DUC team members as separate and additional documentation requirement until the electronic health record (EHR) system was upgraded in May 2017, approximately one month after the project end-date. This may have resulted in a potential underreporting of actual consultation numbers. A more accurate and larger data set might impact the final findings and implications of the project.

The ability to safely and efficiently insert an IUC impacts patients, staff nurses (RNs), physicians (particularly urologists), the infection prevention department, performance improvement department, and the medical center administration. Alleviation or minimization of patient discomfort improves patient safety and satisfaction. The

avoidance of unnecessary procedural complications financially benefits the organization, as well as the overall national healthcare system. Urologists benefit from decreased consultations for DUC placement and the resulting additional time for scheduled procedures and office/clinic responsibilities. Staff nurses, as well as patients benefit by having additional resources available for DUC insertions. Because of the identified benefits, there are possibilities for translation to other nursing based cognitive and skill-dependent procedures (i.e. difficult IV insertions or difficult nasogastric tube placement). Finally, particular components of a successful RN DUC team might become a beneficial addition to the practice resources within other healthcare organizations.

Currently, nursing students gain clinical practice skills through a variety of experiences such as school based simulation centers, clinical patient care assignments, and clinical nursing unit rotations. However, the effectiveness of these experiences may be dependent upon the clinical site/environment, experiences or interests of the nursing faculty or preceptor, and the student's motivation to learn and become proficient with clinical skills. Based on the DUC team training methods, additional didactic content and simulation training may be important considerations related to critical decision-making and patient safety. Additional training with interactive classroom presentations, case studies, critical decision-making scenarios, and simulated validation of skill competency may be a more comprehensive approach for adequately assuring clinical expertise, as well as preparing future RN DUC insertion team members.

Recommendations

Prior to implementing the RN DUC team program, an extensive literature review yielded very little information regarding standardized approaches to DUC insertions. Two algorithms (Appendix A and Appendix B) were reviewed and modified for use within the practicum facility (Appendix C) (Villanueva & Hemstreet, 201; Willette & Coffield, 2012). The DUC algorithm and DUC team contact process was then incorporated into the organizational UC policy. Following this quality improvement evaluation project data collection and analysis, the RN DUC team was determined to have an insertion success rate of 89.6% and has contributed to an organizational cost reduction related to a sustained decrease in iatrogenic trauma related complications (surgical repair, CAUTIs, and length of stay).

Based on these findings, it is recommended that the practicum facility continue the RN DUC team program. The program is cost neutral because the RNs respond to DUC consultations during regularly scheduled work shifts. The cost of incidental overtime incurred by team member attendance at additional training, updates, and mandatory annual meetings would be offset by the prevention of non-reimbursed treatment of complications.

With the implementation of electronic documentation upgrades in May 2017, DUC activities will be more easily reported. It is recommended that the findings from the DNP quality improvement project be used as a baseline and DUC team outcomes be monitored/reported quarterly or biannually. Also, a means of determining more specific contributions to organizational cost savings would be beneficial evidence to further

support the effectiveness of the RN DUC team. Finally, the data regarding DUC team consultations were based upon voluntary DUC team documentation which was additional UC insertion information. As a result, DUC team consultations may have been underreported. With the updated documentation platform, DUC consultations and insertions can now be indicated and accurately captured. If DUC team consultations are consistently low, organization wide awareness campaigns may assist with improving staff requests. As theorized by Benner (2001), clinical knowledge develops over time, and skill acquisition accelerates with repetition. Increasing RN DUC team consultations would ensure adequate clinical exposure and assist with maintenance of expert level skills for members.

Contribution of the Doctoral Project Team

For the DNP project, there was not a formal project team. However, key individuals from various organizational departments were necessary for data collection and analysis. Additional information regarding urology consultations was obtained from the urology department office manager. Following e-mail requests indicating specific information and time-frame, reports were received, collated, and analyzed. Individuals were contacted for content clarification when necessary. To assist with data formatting and analysis, 2 PhD prepared biostatisticians were consulted, and face-to-face meetings scheduled. Final project outcome data interpretation, significance of findings, and dissemination planning was then further developed following discussion with the urology department physician chair and the facility chief nursing officer (CNO).

Strength and Limitations of the Project

A noted strength of the quality improvement evaluation project was the availability of information related to an already implemented practicum site program. Data from an extended period of time was readily available and relatively easy to obtain. However, pre-implementation, in-process, and outcome measures were not considered or available prior to program implementation, making benchmarking and improvements difficult to measure without comparisons.

Other limitations were related to the data reporting. The urology consultation data supplied by the urology department was derived from a computer system which was different from the site facility. Because of the coding systems, data regarding complications (ICD-10 inpatient and CPT billing coding) could not be cross referenced. Owing to the time limitations of the doctoral project, manual chart reviews were therefore not practical. Additionally, the practicum site was an adult academic and Level I trauma center, making RN DUC team implications for other organizations with potentially fewer resources difficult to determine.

Although a somewhat novel concept, the development, implementation, and evaluation of RN DUC teams in other organizations or settings would be beneficial. Publication of findings would bridge the knowledge gap regarding skill development within the nursing scope of practice, improve patient outcomes, and assist with cost reduction within the healthcare system. Because of the identified project outcomes, there are possibilities for translation to other nursing based cognitive and skill dependent procedures (i.e. difficult IV insertions or difficult nasogastric tube placement). Finally,

the theoretical foundation of nursing is strengthened when existing frameworks or models are utilized to guide projects. Benner's model, from novice to expert, provided an effective illustration of how nursing knowledge and clinical competence can be developed through additional knowledge acquisition and skill repetition (Alligood, 2014; Benner, 2001; Benner et al., 2009). Incorporation of her model into other clinical based projects would assist with skill development and validation.

Section 5: Dissemination Plan

Traditional methods of communicating and disseminating evidence-based information include writing for publication and poster/podium presentations at conferences. Poster presentations provide an effective means of displaying and summarizing information. According to Hand (2010), posters have the potential to reach a larger audience because they may be displayed for longer periods of time and they provide an opportunity for interpersonal communication between the author and interested viewers. Oral or platform presentations provide a means of sharing information with seated groups and attendees at local, state, and national conferences (El Sabbagh & Killu, 2015). Regardless of the dissemination method, information should be tailored to fit the specific needs and interests of the target audience (scholars, practitioners/clinicians, or the general public) (Walden University, n.d.).

For the practicum site facility, an oral PowerPoint and/or poster presentation would be appropriate for dissemination of outcomes. A well-developed poster could be displayed along with others during nursing research day. An oral PowerPoint presentation could be presented during a monthly meeting of the nursing research, nursing practice, and nursing leadership councils. Finally, a presentation could be delivered during one of the monthly nursing grand rounds.

To impact clinical practice and achieve evidence-based outcomes, it is imperative that new knowledge and research findings be disseminated to the greater healthcare community (Oermann & Hays, 2016). Graduates of DNP programs are expected to have the knowledge, skills, and competencies necessary to navigate complex healthcare

systems, lead innovative practice change, and impact health outcomes through the translation and implementation of best evidence (Walker & Polancich, 2015). Christenbery and Latham (2013) suggested that nursing scholarship involves inquiry, creativity, and engagement in scholarly activities that include methods of information dissemination. In addition to disseminating findings at the practicum site facility, I could present an oral PowerPoint and/or poster presentation during an annual state hospital association meeting or a national nursing conference (Magnet or National Association of Clinical Nurse Specialists). Because of the lack of published nursing literature and potential transferability for other skill-based procedures, submitting a manuscript for publication would provide an effective means of strengthening nursing theory and providing usable information for other healthcare professionals.

Analysis of Self

During the DNP program, I had numerous opportunities to develop a knowledge base and skill set necessary for implementing evidence-based nursing practice change at both the micro and macro organizational levels and to observe measurable improvement in patient outcomes. My practicum preceptors/mentors provided occasions for me to network and collaborate with other professionals, as well as participate in multidisciplinary meetings that would have otherwise been unavailable to me. My experiences confirm the expectations that the DNP-prepared scholar-practitioner will improve patient, population, and health policy outcomes by translating evidence into practice and acting as a change agent through effective organizational leadership (see Walker & Polancich, 2015). Four of the eight essentials of doctoral education were

present and influencing factors in my academic and professional practice development: organizational and systems leadership for quality improvement, clinical scholarship and analytical methods for evidence-based practice, inter-professional collaboration for improving patient and population health outcomes, and advanced nursing practice (American Association of Colleges of Nursing, 2006).

One of the challenges with completing the project was taking a large volume of available data and discerning which components would best reflect the information necessary to answer the practice-focused question. A significant component of my scholarly journey has been the ability to identify practice issues and to find the resources necessary to address them. With recommendations from my project mentor and respected colleagues, I was able to narrow my focus, and the project became more manageable. Perseverance and humility have been key lessons learned throughout my scholarly journey. The ability to evaluate the effectiveness of a program using existing evidence has been a very rewarding experience. Best practices of enhanced patient comfort and safety, improved nursing skill development, and organizational expense reduction were validated using evidence obtained during this quality improvement evaluation project.

Summary

Translation and implementation of EBP promotes quality outcomes, efficient use of available resources, and financial stewardship (Moule, Armoogum, Douglass, & Taylor, 2017). The process of evaluation supports EBP by including a formalized or systemic means of assessing the effectiveness of a service or program (Moule et al., 2017).

Through evaluation, a determination of what is working well and where adjustments are needed for further improvement becomes possible.

The placement of an UC is a common procedure performed by U.S. nurses (Mori, 2014). However, due to specific preexisting conditions and comorbidities, some catheterizations may become more challenging than initially expected. In response to urologic complications attributed to repeated failed UC insertion by nurses, cases of pre-bladder UC balloon inflation, and concerns related to patient safety in an academic medical center, a 34-member RN DUC team program was launched in October 2012. The purpose of the DNP doctoral project was to conduct a quality improvement evaluation regarding the effectiveness of the DUC team program using data obtained from May 1, 2013 through May 31, 2017. Effectiveness validation of a DUC team in a Level I and academic medical center was accomplished. The RN DUC team was found to have an 89.6% insertion success rate and to have contributed to reducing urology consultations, CAUTI development, iatrogenic urethral injury, and organizational expenses.

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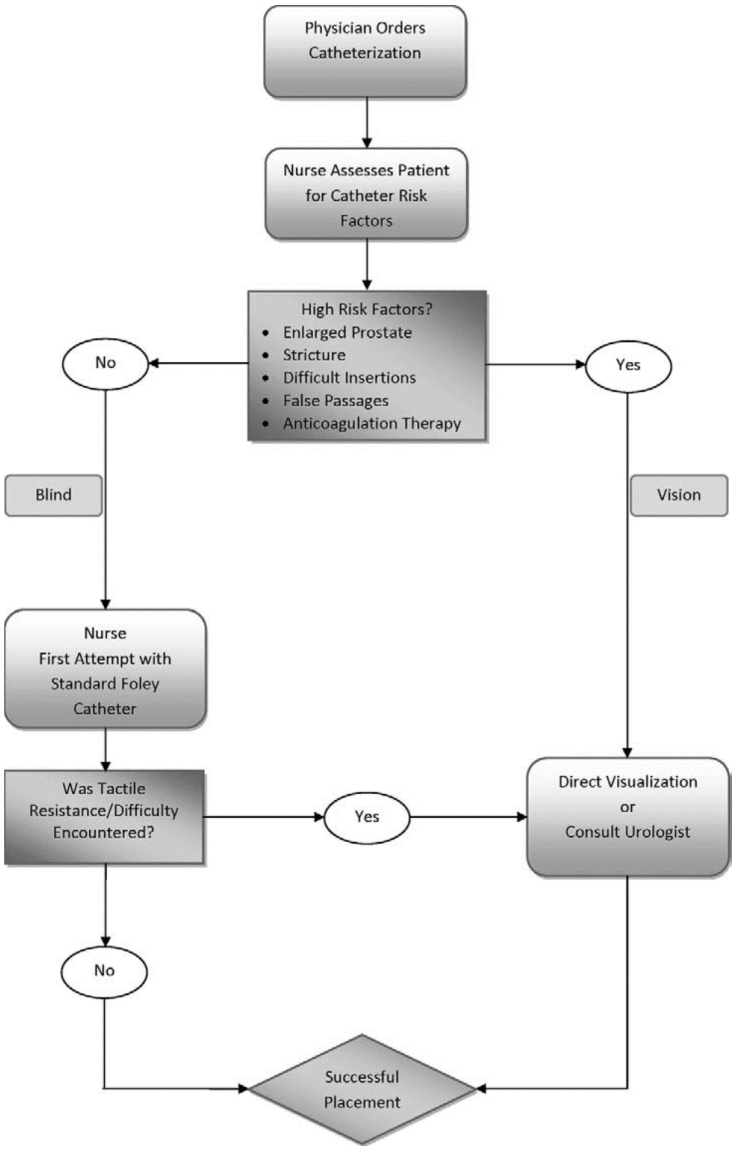
410X.2011. 10510.x

Appendix A: Algorithm for Guiding Decision Making During Difficult Urinary Catheterization Cases



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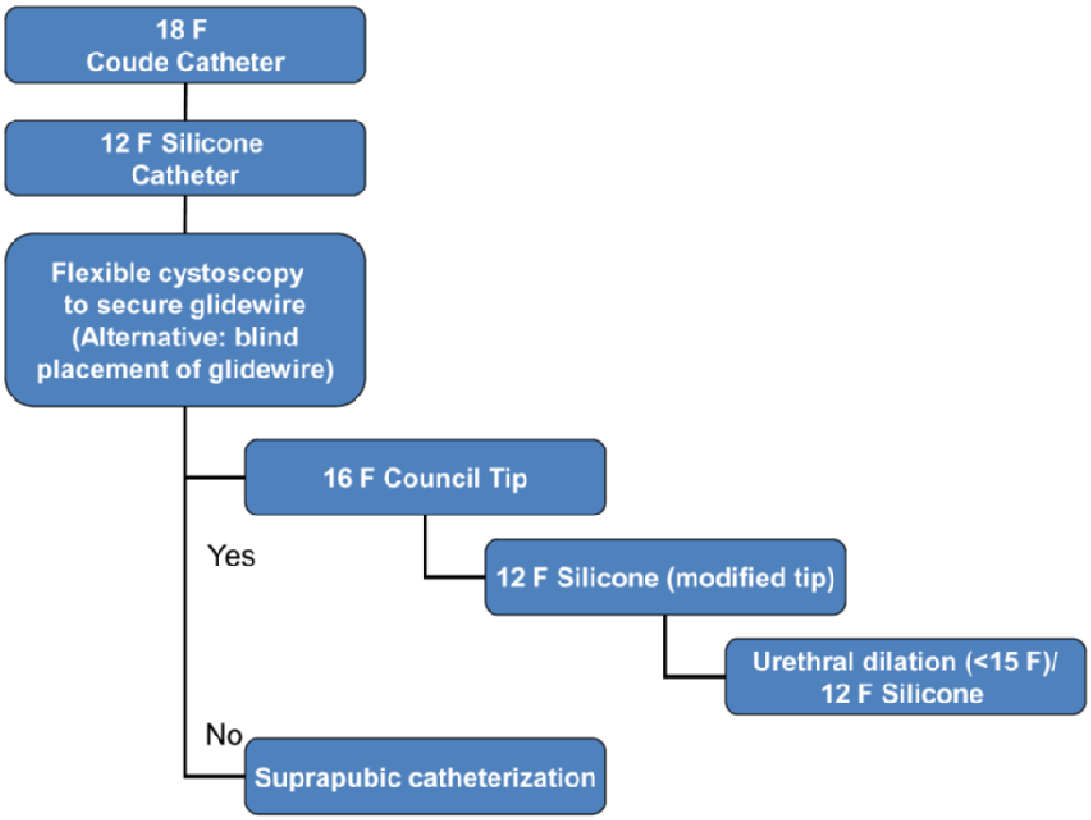
Appendix B: DUC Algorithm



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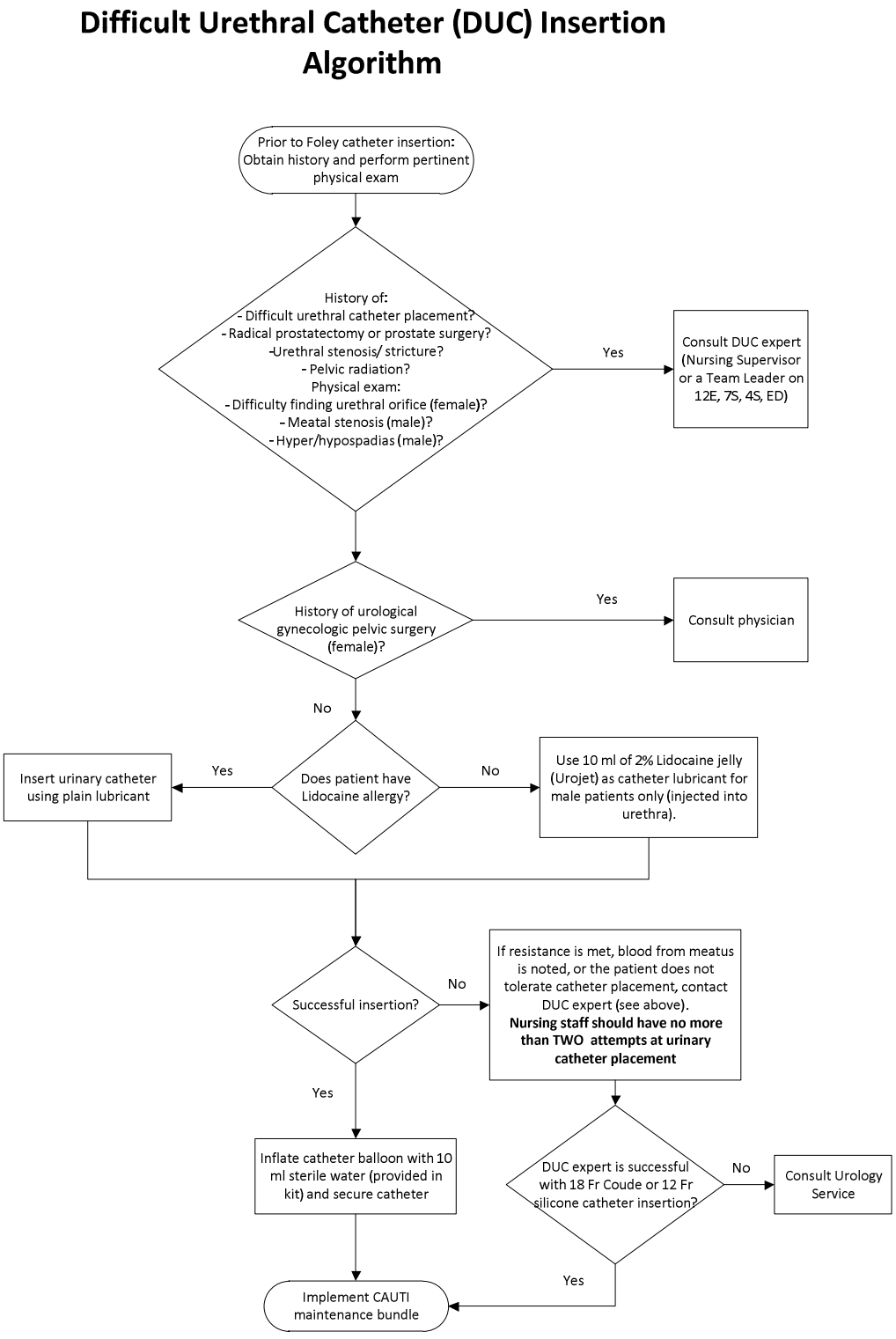
Appendix C: Difficult Urethral Catheter (DUC) Insertion Algorithm



Appendix D: Difficult Urethral Catheter (DUC) Insertion Team Response Bag

Appendix E: Difficult Urethral Catheter (DUC) Insertion Team Lapel Pin

Designed and manufactured by "Signature Pins" Orlando, FL, info@signaturepins.com

Appendix F: Institutional Review Board Approval Numbers

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Expedited Review: 10/17/2017

Walden University Office of Research Ethics and Compliance

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