

Running head: IMPLEMENTING A PROTOCOL FOR PUREWICK

REDUCING CATHETER-ASSOCIATED URINARY TRACT INFECTIONS BY
DEVELOPING AND IMPLEMENTING A PROTOCOL FOR THE USE OF THE PUREWICK
(EXTERNAL FEMALE CATHETER)

A DOCTOR OF NURSING PRACTICE PROJECT SUBMITTED TO THE OFFICE OF
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By:
Marisa Takiguchi

Committee:
Kristine Qureshi, Chairperson
Karen Tessier
Tina Truncellito

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Abstract

Catheter-Associated Urinary Tract Infections (CAUTI) can occur when a urinary catheter is inserted through the urethra and used for urine output management. Microbes can colonize the urinary catheter and can cause infection of the urinary tract. If left untreated, these urinary tract infections can spread, enter the bloodstream and ultimately cause sepsis and potentially death. Thus, healthcare facilities have tried to decrease their CAUTI rates to improve patient outcomes and the quality of care. The PureWick female external urinary catheter has been introduced at a tertiary medical center in Honolulu to address CAUTI rates. This project aimed to address CAUTI rates by implementing an algorithm that indicates appropriate candidate criteria for the PureWick in two ICU units. In-service trainings were provided to the RN staff at both units through a PowerPoint presentation. Pre and post-tests were administered to compare the staff's baseline knowledge about the device with their knowledge after the in-service trainings. Out of the 78 MICU RN staff and the 37 NSICU RN staff, 30 of the MICU RN staff and 25 NSICU RN staff received the in-service training and completed both the pre-test and post-test. The average MICU pre-test score was 4.73 out of 6 (79%) and the average NSICU pre-test score was 4.23 out of 6 (71%). The MICU average post-test score was 5.63 out of 6 (94%) and the average NSICU post-test score was 5.54 out of 6 (92%), showing an increase in knowledge. To evaluate the use of the PureWick device, a weekly log was created for RN staff to fill out and indicate: if they had a PureWick candidate, if they used the PureWick device and if they had any comments to provide reasoning for not using the device if the patient was considered appropriate. The results from this project suggest that education is an effective intervention to increase RN staff knowledge. Although CAUTI rates increased during the implementation, it is important to also consider the short implementation period of this project.

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Introduction

According to the Centers for Disease Control and Prevention (CDC), catheter-associated urinary tract infections (CAUTI) are the most common type of healthcare-associated infection (CDC, 2015). When an indwelling urinary catheter (IUC) is inserted through the urethra and placed in the bladder, urinary tract infections can occur as microorganisms can enter the urinary tract. Risk factors for CAUTI include female sex, age, and prolonged use of the IUC (CDC, 2015). CAUTIs if left untreated can cause bacteremia, sepsis, and ultimately death. Thus, health care organizations have tried to use alternative devices instead of indwelling catheters to reduce CAUTI. A tertiary medical center in Honolulu has introduced the PureWick female external urinary catheter as an alternative to the standard Foley IUC in an attempt to reduce CAUTI rates. This project focused on creating and implementing an algorithm that indicates appropriate candidate criteria for the PureWick and educating the nursing staff on the device. Long term outcomes are expected to result in reduced CAUTI rates.

Description of the Problem

CAUTIs are a major issue for acute care hospitals as this condition is preventable with appropriate use, adherence to sterile technique, proper care and timely removal (Chenoweth & Saint, 2013). In addition, the Center for Medicare and Medicaid Services stopped reimbursing hospitals for preventable healthcare-associated infections such as CAUTI; as a result, it is very costly for hospitals to pay for treatment for each CAUTI case (Saint, Meddings, Calfee, Kowalski, & Krein, 2009). According to the Agency for Healthcare Research and Quality (AHRQ, 2017), there is an estimated additional cost of \$13,793 for each CAUTI case. The financial burden as well as striving to improve patient quality and safety are both considered

triggers for this DNP project. The tertiary medical center in Honolulu has strived to address CAUTI issues through the use of the PureWick external female urinary catheter.

Review of Literature and Synthesis

Search Strategy

CINAHL and PubMed were used to find articles on female external urinary catheters, the PureWick, effectiveness of algorithms on clinical decision making and CAUTI. Search terms included “catheter-associated urinary tract infections,” “CAUTI,” “female external urinary catheter,” “PureWick,” “algorithms,” “protocol,” “clinical decision making,” “education,” “nurses,” “evidence-based practice,” and “patient outcomes.” Articles that were written in English were selected as well as articles that included human subjects; the articles that were obtained were published between 2006 and 2018. For additional literary resources, a PureWick representative was contacted.

There were approximately 2256 articles found when searching for “catheter-associated urinary tract infection” alone, 276 articles that were found when searching for “female external urinary catheter” alone, 52 articles for “algorithm” AND “catheter-associated urinary tract infections,” and 1240 articles were found using “education” AND “nurses” AND “evidence-based practice” AND “patient outcomes.” Of these articles, 12 articles and one poster presentation were critiqued. Articles were chosen based on several themes: CAUTI prevention, female external urinary catheters, algorithms and education as an intervention.

Grading Tool

The grading tool used for this project was Mosby’s level of evidence (Ackley, Swan, Ladwing, & Tucker, 2008). The levels of evidence ranged from Level I to Level VII with Level I evidence being the highest level, such as systematic reviews and meta-analyses. The lowest

levels of evidence (Level VII) included evidence from opinions or reports from committees or experts (Appendix A).

Literature Synthesis

CAUTI prevention. A study done by Hu and colleagues (2015) found that inappropriate use of urinary catheters was an issue and a significant predictor for increased length of stay, prolonged use of the urinary catheter and increased CAUTIs. In this study, 321 patients were included, and it was found that 38.3% had initial inappropriate use of urinary catheters; convenience care was the most common reason for inappropriate use (Hu et al., 2015). In addition, the study found that patients with increased inappropriate catheter days were associated with more CAUTI (adjusted OR 1.21) and catheter-related complications (adjusted OR 1.17) (Hu et al., 2015). Several other studies and quality improvement projects have targeted reducing urinary catheter days, avoiding inappropriate use of indwelling catheters and implementing bundles to reduce CAUTI rates (Chenoweth & Saint, 2013; Hu et al., 2015; Laan et al., 2017; Reilly et al., 2006; Scott et al., 2014).

Female external urinary catheters. Female external urinary catheters such as the PureWick device have been found to reduce CAUTI rates. In a case study by Beeson and Davis (2018), the effectiveness of a female external urinary collection device, called the PrimaFit, was assessed. Three patients were studied and in two of the cases, sleep throughout the night was restored with using the PrimaFit device to address nocturia in these patients. The case study also reported that nurses and patients were satisfied with the use of the device (Beeson & Davis, 2018). Another study by Beeson, Davis, and Vollman (2018) found that in the SICU, the number of indwelling urinary catheter days decreased by 9% and CAUTI rates decreased by 27% in a short 6-month period of the pilot study. A poster presentation at Tri-City Medical Center in

California reported that CAUTIs were eliminated using the PureWick device, RNs were satisfied with how easy the device was to use, and the PureWick allowed for earlier IUC removal (Mattia, Okumura, Garcia, Reynolds, & Eckert, n.d.). Another case study found that among 16 patients there were no instances with symptomatic UTI and no skin issues using the PureWick device (Newton, Call, & Chan, 2016).

Algorithms. Algorithms have been implemented in facilities to help nurses and physicians guide their clinical decision making. A quality improvement project done by Thomas used several approaches to decrease CAUTI rates: implementing a nurse-driven protocol, developing an evidence-based nursing algorithm used for IUC indications, and also removing non-indicated IUCs (Thomas, 2016). Nursing rounds as well as the nursing-algorithm and educational sessions to remind nurses about appropriate indwelling catheter use led to a statistically significant decrease in CAUTI rates ($p = 0.009$) (Thomas, 2016).

Education. Evidenced-based practice education has been shown in several studies to be an effective method to improve patient outcomes and increase knowledge in the nursing staff. Two systematic reviews showed similar results suggesting that education as an intervention among nurses improves patient outcomes and clinical practice. One systematic review found that education as an intervention improved nurses' knowledge of evidence-based practice to benefit patient outcomes (Wu et al., 2018). Another systematic review found that nurses reported improvements in their knowledge base and had increased confidence in using the guidelines and changing their clinical practice (Häggman-Laitila, Mattila, & Melender, 2017).

Quality/Quantity/Consistency of Evidence

The level of evidence regarding education of nurses as an intervention to positively impact patient outcomes using an evidence-based practice method is high. These studies were

mostly systematic reviews and provided evidence to support the education of nurses as an intervention to improve patient outcomes. The quality of the evidence for finding strategies to reduce CAUTI rates mostly consisted of quality improvement projects and case reports.

Similarly, there were limited high-quality studies on the PureWick device itself; since it is a new device, there has been limited evidence to show that the PureWick device and female external urinary catheters have the potential to reduce CAUTI rates, especially in acute care facilities.

Weaknesses/Gaps/Limitations of Literature

Limitations of the literature mainly include the level of evidence and small sample size; many of the studies were quality improvement projects that aimed to reduce indwelling urinary catheters use and reduce urinary catheter days. In addition, many of the articles that discuss the use of algorithms are mostly quality improvement projects as well. In regard to the effectiveness of the Purewick device itself, there is limited quality evidence as the studies were hospital-based and case studies, which are considered low levels of evidence.

Intervention

One of the interventions for this project was to create and implement an algorithm that indicated appropriate candidate criteria for the PureWick female external urinary catheter. The PureWick as well as other female external urinary catheters have been shown to be effective in reducing CAUTI rates while being able to manage urine output in female patients (Beeson & Davis, 2018; Beeson et al., 2018; Mattia et al., n.d.; Newton et al., 2016).

In addition to creating and implementing an algorithm for the PureWick device, nursing staff were educated on the device. Education as an intervention has been shown to be effective in

improving the knowledge of the nursing staff, creating practice change, and impacting patient outcomes (Wu et al., 2018; Häggman-Laitila et al., 2017).

Conceptual Framework

The IOWA model was used for this project (Buckwalter et al., 2017). The IOWA model guides recognition of clinical or patient issues such as CAUTI rate reduction and helps to determine if this issue is a priority for the organization. Once the purpose is deemed to be a high priority for the organization, a team is formed, and a literature review is conducted to search for evidence. The project will then be implemented and evaluated in terms of success. A graphic representation of this model is included in Appendix B (Figure 1) at the end of this document.

PICO Question

A PICO(T) question for this project was used to provide structure for this evidence-based quality improvement project. Elements of a PICO(T) question include the problem/population, intervention, comparison, outcome and time. The PICO(T) question for this project was: In adult female patients greater than 18 years of age admitted to the ICU at a tertiary medical center in Honolulu (P), will developing and implementing a protocol (I) for the use of the PureWick female external urinary catheter compared to current practice (C) decrease catheter-associated urinary tract infections (O) over a defined period of time (T)?

Methods and Procedures

Purpose Statement and Project Objectives

The purpose of this evidence-based quality improvement project was to reduce CAUTI rates by developing and implementing a protocol for the use of the PureWick female external urinary catheter in women admitted to the ICU at a tertiary medical center in Honolulu. Project objectives included: (a) create an algorithm by mid-July 2019 that indicates appropriate

candidate criteria for the PureWick female external urinary catheter; (b) provide training on how to use the PureWick device to ICU nurses by mid-August 2019; (c) implement the algorithm at the ICU from September 2019 to mid-December 2019; (d) measure CAUTI rates by the end of December 2019 and compare to pre-implementation CAUTI rates.

Sampling Plan

Setting. This project took place at a tertiary medical center in Honolulu in the ICU department, which includes the Medical ICU and the Neuroscience ICU. The tertiary medical center's Medical ICU is equipped with 19 beds and the NSICU is equipped with 8 beds. These were the units of choice as many of the patients in the ICU frequently use IUCs.

Sample. The accessible population of this study were registered nurses working in the medical intensive care unit (MICU) and the NSICU located at a tertiary medical center in Honolulu. There are approximately 78 MICU nurses and 37 NSCIU nurses who needed PureWick training. The target population size was 78 MICU nurses and 37 NSICU nurses for a grand total of approximately 115 ICU nurses. Of the 115 registered nurses, 30 MICU RNs and 25 NSICU RNs participated in the project. The inclusion criteria were registered nurses who work in the MICU or NSICU. Exclusion criteria included nurses who were on vacation or leave of absence.

Procedures

Human subjects consideration. The author has completed the Collaborative Institutional Training Initiative (CITI) Training for research ethics and compliance, and Health Insurance Portability and Accountability Act (HIPAA) Training on patient privacy protections. This DNP project involved making judgments about a program to improve or further develop program effectiveness and inform decisions about future programming within an organization

(University of Hawaii Human Studies program, personal communication, August 2, 2018). All these tasks were related to quality improvement and did not produce generalizable knowledge. Thus, this project did not require IRB application and review.

Measurements. The measurement tool that was used to determine the CAUTI rates during this project was a calculation that is provided by the CDC. The calculation is made by dividing the number of CAUTIs by the number of catheter days and multiplying the result by 1000 (CDC, 2019). The baseline CAUTI data for Fiscal year 2019 was provided by Dr. Tina Truncellito who is the Clinical PI Coordinator in Quality & Patient Safety at this tertiary medical center in Honolulu and is the content expert for this project.

To measure and evaluate the effect of implementation of the protocol, a student-developed weekly log was used that indicated whether RNs were using the PureWick device when indicated, or why they were not using the PureWick when it was appropriate for a patient to use (Appendix C). The data measurement tool that was used to assess the effectiveness of the in-service training sessions was an attendance sign-in sheet and a student-developed pre-test and post-test to evaluate registered nurses' knowledge on the PureWick (Appendix D).

Data collection. Once baseline CAUTI data was collected, the algorithm based on the manufacturer's guidelines was created by July 15, 2019 and submitted for review by the content expert. Edits to the algorithm were made and resubmitted to the content expert by July 22, 2019. The algorithm was then printed and posted to the ICU and NSICU units by July 29, 2019.

As for the in-service training session, an approximate 10-minute PowerPoint presentation on the PureWick device was created and submitted to the content expert for approval by July 8, 2019. Any edits to the PowerPoint presentation were made and completed by July 14, 2019. Then, a pre-test and post-test were developed to assess participants' knowledge of the PureWick

device and submitted to the content expert for approval by July 8, 2019. The number of training sessions to be held was determined by July 14, 2019 as the nurse managers were contacted to get a list of the possible attendees. By July 14, 2019, revisions to the pre-test and post-test were made. The location and time of the educational sessions were determined by July 19, 2019 and the nurse managers were contacted to have the charge nurses of each shift announce the details of the educational sessions to be held. Flyers for the in-service trainings were created, printed and posted in the nursing lounges and nursing station in each unit by July 22, 2019. The pre-tests and post-tests as well as the attendance sheet were printed by July 22, 2019. The in-service training sessions were conducted from the end of July 2019 until late August 2019. The pre-test was administered in the first few minutes of the training session; an approximate 5 to 10-minute PowerPoint presentation followed and the post-test was administered immediately after the PowerPoint presentation. The pre-test and post-test data were collected after each session and were entered in Microsoft Excel. Food was provided to the staff members who attended the in-service training sessions.

For the intervention, a weekly log was created by April 1, 2019 (see Appendix C) and was posted at the nursing station or supply room from September 2019 until mid-December 2019. The DNP student checked-in with each unit three times per week during this timeframe. Post-implementation CAUTI data was obtained by the content expert by the end of December 2019. For a detailed list of the procedures and activities, please refer to the project's logic model (Appendix E) and Gantt Chart (Appendix F).

Data analysis. A trend analysis was used to analyze the data on the number of PureWick candidates and number of PureWick uses to determine the effectiveness of the algorithm as well as the in-service training sessions. For the CAUTI rates, pre-implementation CAUTI rates were

entered in Microsoft Excel and compared to post-implementation CAUTI rates. An upward or downward trend in CAUTI rates was then determined. In regard to knowledge about PureWick, pre-test and post-test scores were entered in Microsoft Excel and the mean score on both the pre-test and post-test was calculated. In addition, a comparative analysis was conducted to determine an upward or downward trend in the data, comparing pre-education session scores and post-education session scores.

Results

Education. Out of the 78 MICU RN staff and the 37 NSICU RN staff, 30 of the MICU RN staff and 25 NSICU RN staff received the in-service training and completed both the pre-test and post-test. Some of the staff were unable to complete the post-test due to unforeseen circumstances regarding patient care and thus were not included in the number of staff who were trained. The average pre-test scores were 4.73 out of 6 (79%) and 4.23 out of 6 (71%) for the MICU and NSICU respectively. The MICU average post-test score was 5.63 out of 6 (94%) and the average NSICU post-test score was 5.54 out of 6 (92%). See Appendix G for a graph of the results.

PureWick use and outcome. After the PureWick in-service training period, there were 22 female patients identified as candidates for the use of the PureWick across both ICU units. Of those candidates, the PureWick device was used on 18 patients. This represents an 81.8% uptake in the use of the device during the implementation period. None of these patients experienced a urinary tract infection.

CAUTI rates. In the 3 months preceding the implementation period of this project, there were no female CAUTIs in the MICU or NSICU. During the implementation period, there were two female CAUTI cases that occurred at one of the ICU units. These CAUTI cases were related

to the use of an IUC. However, there were no reported UTI cases related to the PureWick during this implementation period.

Discussion

The PureWick device is a non-invasive alternative for urine management for select female patients. Because the device is new to the healthcare facility, education played an important role in the appropriate use of this device. While most of the RN staff were trained on the device, some were lost due to conflicting schedules with the dates and times of the training sessions as well as the need to address and prioritize patient care at the time of the in-service sessions. However, as the results indicate, there was an overall increase in knowledge on the PureWick device for both the MICU and NSICU. This shows that the training sessions were effective in educating the RN staff and promoting use of the external urinary collection system.

In regard to the use of the PureWick algorithm and the use of the PureWick device, the results from the weekly log indicate that the RN staff were using the algorithm that was developed to help them select appropriate patients for this device. There was an 81.8% uptake in the use of the PureWick device after the staff were provided the in-service training on the device. This shows that this project was overall successful in educating the staff and increasing use of the device in the two ICU units.

While there were two reported female CAUTI cases during the implementation period, these cases were related to IUC use. In fact, there were no PureWick related UTIs reported during the implementation period. However, due to the short implementation period, it is not possible to draw conclusions regarding the effect of the PureWick on CAUTI rates. With increased use of the PureWick device, CAUTI rates should decline over time.

Challenges

There were some challenges that were encountered during the implementation process of this project. One challenge was providing education on the PureWick device for every RN on the staffing list. While many of the staff members were able to receive the PureWick in-service training, some were not able to complete the training session due to scheduling of their shifts which did not coincide with the in-service training dates or due to the busy nature of the ICU. Some RNs were also unable to complete the entire training session due to their job demands as an RN or other unforeseen circumstances. Thus, in-service trainings were kept short and as brief as possible. Another challenge was ensuring the RN staff were using the weekly log and documenting accurately. There were some instances when the number of PureWick candidates was documented, but the number of PureWick uses was not and there was no comment to address this discrepancy. Additionally, there were some instances when the number of PureWick candidates was left blank, but the number of PureWick uses was documented.

Recommendations for Clinical Practice and Future Study

While this project showed improvement in the nurses' knowledge of the use of the PureWick device, there are still suggestions for future studies and recommendations for clinical practice. Educating all staff members can be difficult due to scheduling and availability. Future studies could include taking a poll on which dates and times most staff are available. To address the issue of complete documentation, future studies could combat this issue by writing clearer instructions and by attending huddles more frequently to reinforce the need for complete documentation. On a larger scale, this project only included two units: the MICU and NSICU. Future projects could include other units to address any CAUTI issues. In addition, adequate education must be provided to all of the clinical staff. Future projects could include educating

other healthcare providers such as nursing assistants, nurse practitioners, residents, physicians and physician assistants. In order for significant change in clinical practice to occur and to ultimately reduce CAUTI rates, it is important to have enough educators or ensure that every RN on staff is trained on how to use this device. Creating sustainable change in an organization can be difficult but can be accomplished with sufficient resources and organizational commitment.

DNP Essentials

There are eight Doctor of Nursing Practice essentials that are described by the American Association of Colleges of Nursing that discuss core competencies that each Doctor of Nursing Practice candidate shall meet (American Association of Colleges of Nursing, 2020). The DNP essentials as described by the American Association of Colleges of Nursing were met and are described in a table at the end of this paper (Appendix H).

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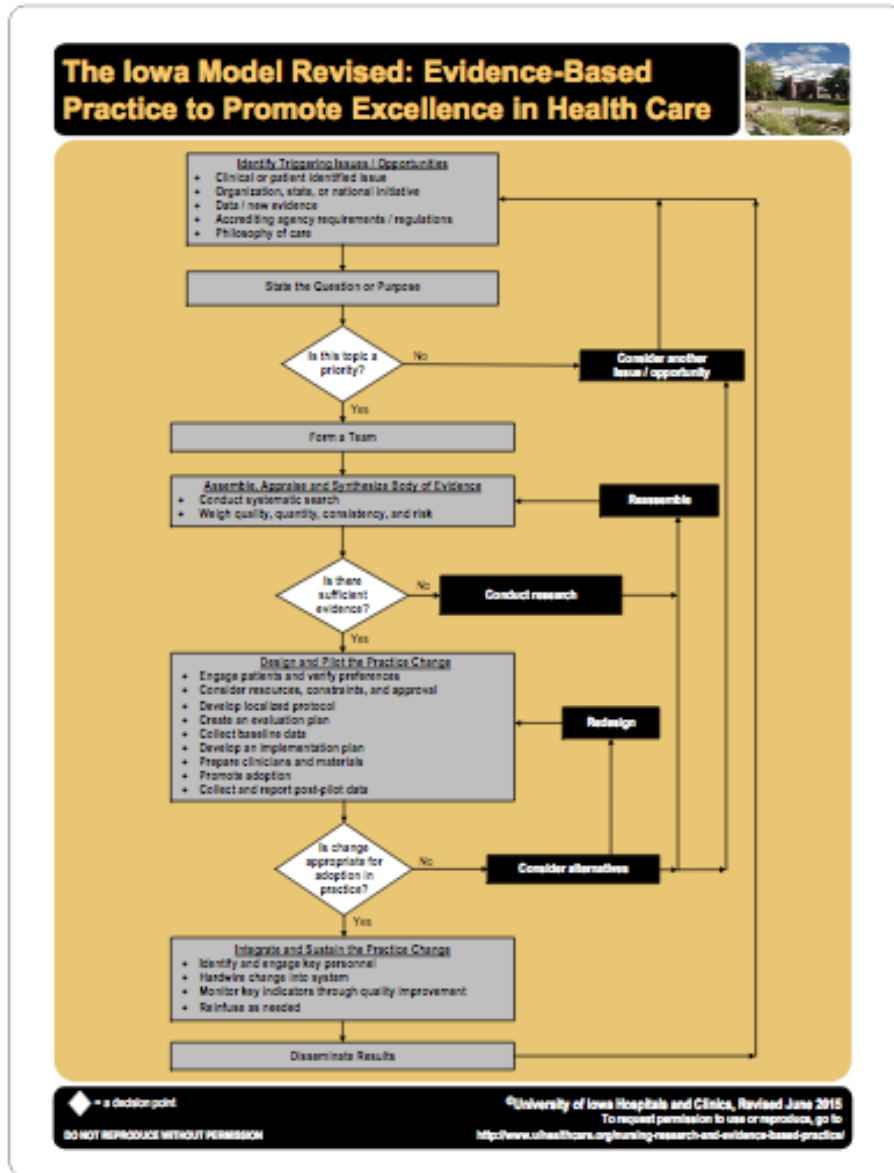
Appendix A

Table 1. Mosby's Level of Evidence

Level of evidence (LOE)	Description
Level I	Evidence from a systematic review or meta-analysis of all relevant RCTs (randomized controlled trial) or evidence-based clinical practice guidelines based on systematic reviews of RCTs or three or more RCTs of good quality that have similar results.
Level II	Evidence obtained from at least one well-designed RCT (e.g. large multi-site RCT).
Level III	Evidence obtained from well-designed controlled trials without randomization (i.e. quasi-experimental).
Level IV	Evidence from well-designed case-control or cohort studies.
Level V	Evidence from systematic reviews of descriptive and qualitative studies (meta-synthesis).
Level VI	Evidence from a single descriptive or qualitative study.
Level VII	Evidence from the opinion of authorities and/or reports of expert committees.

Appendix B

Figure 1. IOWA Model Revised



Appendix C
Measurement Tools

Table 2. Weekly log for PureWick use

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
# of PureWick Candidates <ul style="list-style-type: none"> • Use tally marks • RN: Print first name and last initial in parentheses after tally mark • Ex.: I (Jane D.) 							
# of PureWick Uses <ul style="list-style-type: none"> • Use tally marks • RN: Print first name and last initial in parentheses after tally mark • Ex.: I (Jane D.) 							
Comments <ul style="list-style-type: none"> • Reasons for not using PureWick • Other comments 							

Appendix D

Figure 2. PureWick Pre-test and Post-test

PureWick Quiz

1. Which of the following are indications for the use of the PureWick female external urinary catheter? Select all that apply.
 - a. Female bed-ridden patients
 - b. Urinary incontinence and/or frequency
 - c. Difficulty ambulating
 - d. Difficulty using bedpan
 - e. Need for accurate measurements of urine output

2. Which of the following are considered inappropriate uses for the PureWick?
 - a. Able to void on own
 - b. Non-bedridden patients
 - c. Urinary retention/bladder obstruction
 - d. Violent/aggressive patients
 - e. Patients with current skin breakdown at the site
 - f. Patients with fecal incontinence without proper fecal management system
 - g. All of the above

3. Do you use clean or sterile technique when applying the device?
 - a. Sterile
 - b. Clean

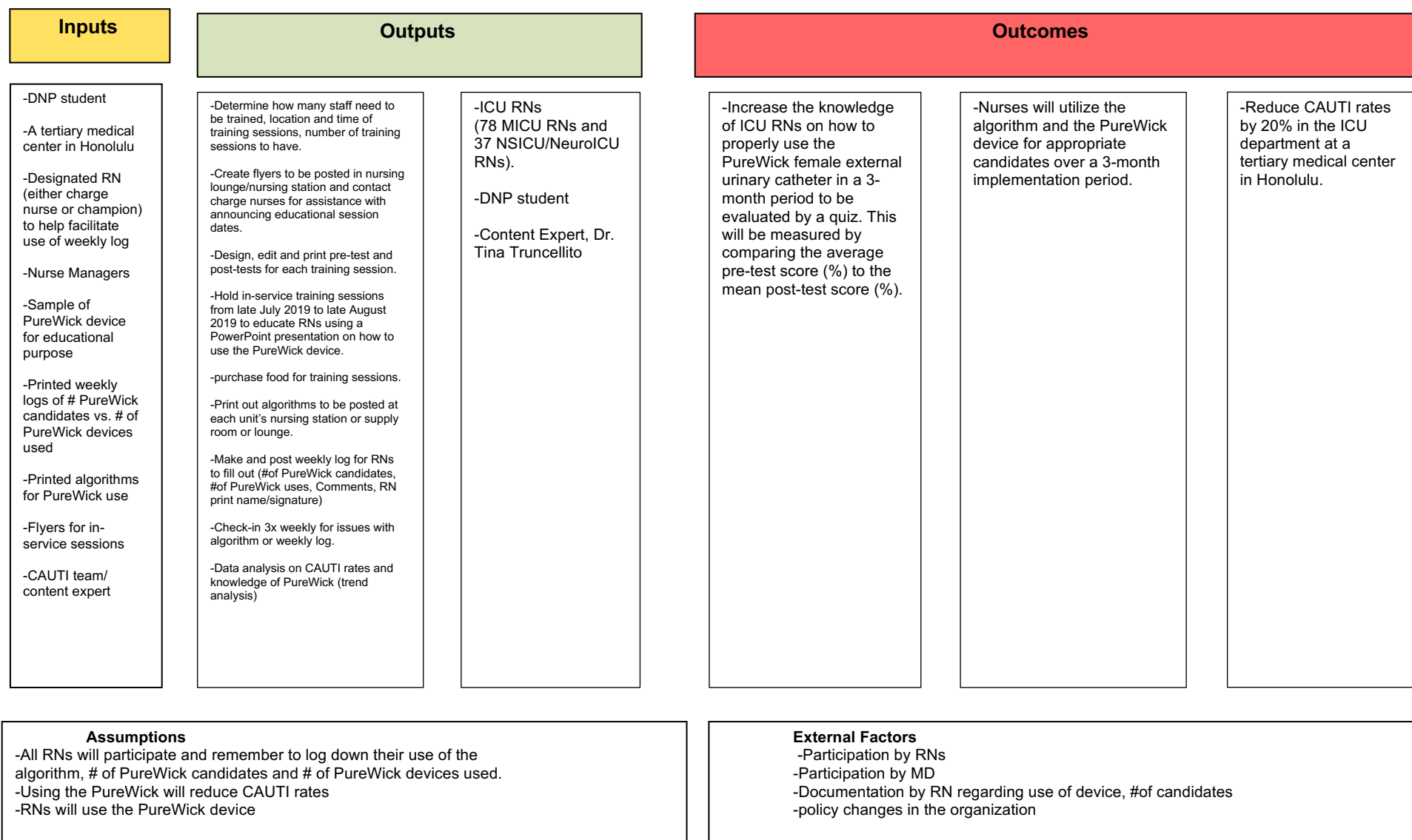
4. What minimum pressure setting should the suction be?
 - a. 40mmHg
 - b. 120mmHg
 - c. 20mmHg
 - d. 100mmHg

5. How often do you need to change the device?
 - a. Every 4 hours
 - b. Every 12 hours
 - c. Every 2 hours
 - d. Every 24 hours

6. How often should you assess the skin and placement of the device?
 - a. Every 8 hours
 - b. Every 4 hours
 - c. Every 2 hours
 - d. Once a shift

Appendix E

Logic Model



Appendix F

Gantt Chart

Objective/Aim	Sub-Tasks	Responsible Person	Due Date	Comments
Major Task #1: Background Project Planning				
Confirm DNP project topic	Determine clinical issues of concern	DNP student	January 2019	Done
Research CAUTI and PureWick device.	Need to find more literature on PureWick	DNP student	February 2019	Asked Dr. Tina and will discuss with PureWick rep to find more literature on PureWick device specifically.
Major Task #2: Identify Site Location				
Confirm DNP project site	Email Dr. Kathman about potential project sites	DNP student, Dr. Kathman	January 2019	Done
Major Task #3: Content Expert				
Confirm Content expert	Email Dr. Kathman and Dr. Tina Truncellito (clinical coordinator and patient safety)	DNP student	January 2019	Done – Dr. Tina Truncellito will be my content expert. Responsibilities of content expert provided to Dr. Tina.
Meet with content expert	Meet w/ Dr. Tina to discuss any changes to DNP project and discuss methods/procedures	DNP student	March 3, 2019	TBD as awaiting to have project chair and then will set meeting with Dr. Tina to discuss methods/procedures and changes to DNP project
Major Task #4: Project chair				
Confirm project chair	Need to confirm who is project chair	DNP student, Dr. Kathman	February 2019	Awaiting project chair assignment from Dr. Kathman
Meet with project chair	Discuss project with project chair	DNP student, Project chair	March 2019	TBD as awaiting project chair assignment from Dr. Kathman
Major Task #5: Retrieve CAUTI data				
To retrieve pre-implementation CAUTI rates at QMC ICU	Email or meet w/ Dr. Tina to retrieve the current # of CAUTI (female patients in MICU, NSCU)	DNP student	April 1, 2019	Completed- data was provided by Dr. Tina Truncellito for each quarter for FY17 up until FY19 Q4.
Major Task #6: Create and Implement PureWick algorithm at a Tertiary Medical Center's ICU in Honolulu				
To create algorithm	Algorithm will be based on the manufacturer's guidelines on how to use the PureWick device	DNP student	July 15, 2019	Done

To create algorithm	Design algorithm <ul style="list-style-type: none"> • Full page and post to nursing station/supply room/lounge 	DNP student	July 15, 2019	Done
To create algorithm	Turn in algorithm to Dr. Tina for revision	DNP student	July 15, 2019	Done
To create algorithm	Make final revisions to the algorithm based off of Dr. Tina Truncellito's comments/suggestions	DNP student	July 22, 2019	Done
To create algorithm	Print algorithms and laminate to be posted at MICU and NSICU units	DNP student	Late July 2019	Done
To implement algorithm	Post algorithm at MICU and NSICU units	DNP student	Late July 2019	Done
Major Task #7: Preparing, Implementing, and Evaluating In-Service education on the PureWick device				
To determine details of education sessions	Turn in PowerPoint to Dr. Tina to be presented at education sessions	DNP student, DNP content expert	July 8, 2019	Done
To determine details of education sessions	Make any changes or edits to the PowerPoint presentation as suggested by Dr. Tina	DNP student	July 14, 2019	Done
To determine details of education sessions	Develop pre-test and post-test <ul style="list-style-type: none"> • Appropriate indications • Contraindications • When to change the device • Pressure setting of suction • Placement of device • Technique used to apply device (clean) • How often to assess skin/placement 	DNP student	July 8, 2019	Done

To determine details of education sessions	Submit pre-test and post-test to Dr. Tina for review	DNP student	July 8, 2019	Done
To determine details of education sessions	Ask nurse managers to get list of RNs who shall attend in-service training	DNP student	July 8, 2019	In process of finalizing the list. Have original staffing list, but waiting for some of the nurse managers to review/edit the staffing list for new hires/those who left/on vacation
To determine details of education sessions	Determine how many sessions will be held	DNP student, DNP content expert	July 14, 2019	Done
To determine details of education sessions	Revise pre-test and post-test	DNP student	July 14, 2019	Done
To determine details of education sessions	Determine location and time of educational sessions	DNP student	July 19, 2019	Done
To determine details of education sessions	Contact nurse managers to have charge nurses announce educational sessions to be held	DNP student	July 19, 2019	Nurse managers: Cheryl Fallon, Leilani Nutt
To determined details of education sessions	Create flyers for education sessions	DNP student	July 22, 2019	Done
To determine details of education sessions	Print and post flyers in nursing lounge and have charge nurses make announcements at the beginning of each shift	DNP student	July 22, 2019	Done
To determine details of education sessions	Print pre-test and post-tests	DNP student	July 22, 2019	Done
To determine details of education sessions	Print attendance sheet	DNP student	July 22, 2019	Done
To determine details of education session	Purchase food for participants at each educational session	DNP student	July 29-August 16, 2019	Done
Implement training sessions	Conduct in-service training sessions	DNP student	End of July to late August, 2019	Have attendance sheet, sign-in, give pre-test right before training session, do PPT presentation, administer post-test right after training session
Evaluate training session effectiveness	Enter quiz scores on Microsoft Excel after each training session	DNP student	End of July to late August, 2019	Done
Evaluate training session effectiveness	Calculate means (pre-test and post-test), trend analysis	DNP student	August 26, 2019	Done

Major Task #9: Evaluation of Intervention (algorithm)				
To determine success of algorithm	Make weekly log <ul style="list-style-type: none"> • Saturday – Sunday (column) • # PureWick candidates (row) • # PureWick uses (row) • RN signature/print name • Comments section (row) 	DNP student	April 1, 2019	Done -Weekly log will have columns for each day of the week (Sat, Sun, Mon, Tues, Wed, Thurs, Fri). RNs will make tally marks and print their first name and last name initial after each tally mark they make for the following rows: #of PureWick candidates, #of uses of PureWick. A comments section (row) will be included for RNs to discuss any issues they encountered or why they did not use the PureWick catheter when indicated.
To determine success of algorithm	Post weekly log to the units (MICU, NSICU)	DNP student	September-mid December, 2019	Every week, the student will post a new weekly log at the nursing station and take down the old log.
To determine any issues with algorithm	DNP student to check-in at each unit to assess for any issues or concerns with the algorithm or weekly log, etc.	DNP student	September-mid December, 2019	Check-in 3x per week to see how units are using the weekly log, and the algorithm. Check for any issues/concerns and note them.
To determine CAUTI rates post-implementation	Collect CAUTI data after implementation of algorithm	DNP student, content expert	Late December, 2019	CAUTI rates to be provided by Dr. Tina
To determine effectiveness of intervention	Trend analysis will be conducted to determine upward or downward trend in CAUTI rates post-implementation	DNP student	Late December, 2019	Done
Update final DNP paper	Add data to the final DNP paper	DNP student	January, 2020	Done

Appendix G

Figure 3. PureWick Pre-test and Post-test Scores

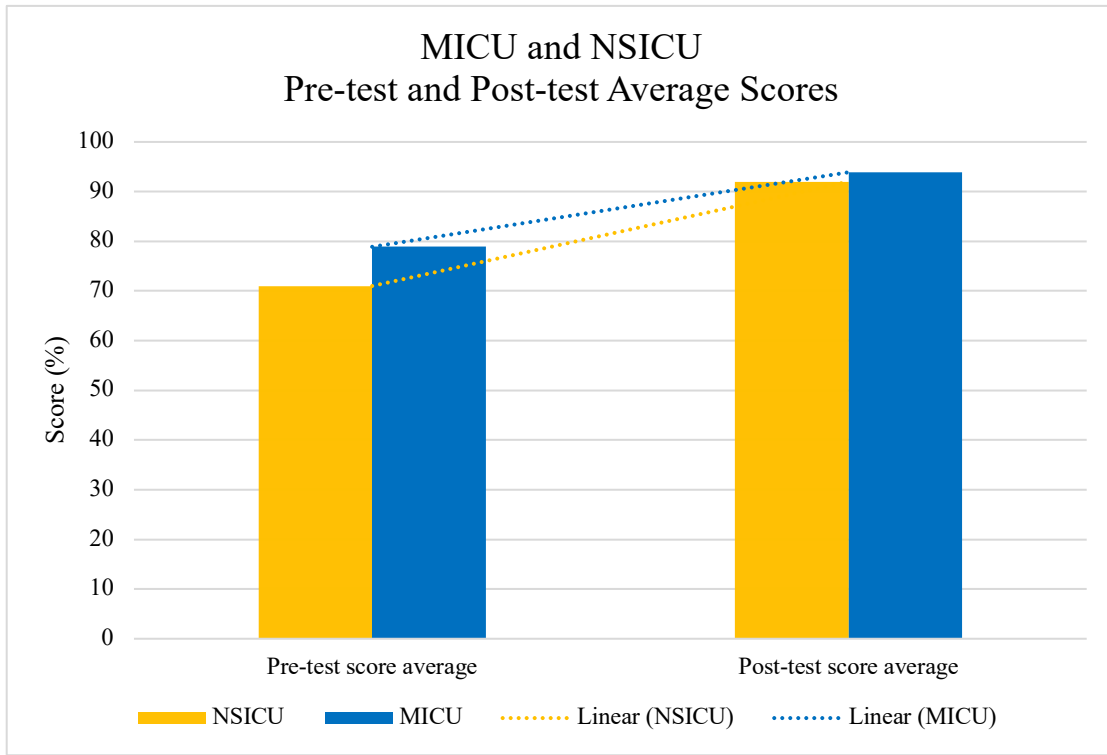


Figure 3 shows the average pre-test and post-test scores for both the MICU and NSICU.

Appendix H

DNP Essential	Explanation of How the Essentials Were Met
1. Scientific Underpinnings for Practice	This DNP Essential was met as this project incorporated science-based concepts to evaluate new clinical practice approaches towards decreasing CAUTI rates using a female external urinary catheter.
2. Organizational and Systems Leadership for Quality Improvement and Systems Thinking	This DNP Essential was met by developing an algorithm that will help guide RN clinical decision making with regard to using the PureWick device for urine output management in select female patients. In addition, this project developed a care delivery approach to address CAUTI rates.
3. Clinical Scholarship and Analytical Methods for Evidence-Based Practice	This DNP Essential was met by conducting a literature search and compiling a literature synthesis that suggests the best evidence for clinical practice when addressing CAUTI rates and when educating clinical staff. This evidence-based quality improvement project was designed to evaluate the outcomes of practice with the implementation of the PureWick device. Additionally, data were collected and analyzed to evaluate the effectiveness of this project. The findings were also disseminated, and challenges of this project were identified.
4. Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care	This DNP Essential was met by designing a program that was used to reduce CAUTI rates and by demonstrating the skills needed to develop a plan to extract data from practice information systems.
5. Health Care Policy for Advocacy in Health Care	This DNP Essential was met by identifying CAUTI rates and learning the appropriate use of the PureWick device as needs of the health organization. Education was provided to the RN staff regarding patient care outcomes with the PureWick and the health organization's policy and procedures regarding this device.

<p>6. Interprofessional Collaboration for Improving Patient and Population Health Outcomes</p>	<p>This DNP Essential was met by communicating with nurse managers, nursing staff (charge nurses, floor nurses, nursing assistants) and other healthcare personnel to implement the PureWick algorithm and encourage use of the device for select patients.</p>
<p>7. Clinical Prevention and Population Health for Improving the Nation's Health</p>	<p>This DNP Essential was met by analyzing scientific data to address disease prevention such as CAUTI rates in a tertiary medical center in Honolulu. In addition, implementing the use of the PureWick device and educating staff members on appropriate candidate criteria has the potential to improve health status of patients.</p>
<p>8. Advance Nursing Practice</p>	<p>This DNP Essential was met by designing and implementing a program that is evidence-based to reduce CAUTI rates. In addition, support to the staff was provided weekly throughout the 3-month implementation period to assist with the introduction of the algorithm and with the use of the PureWick device.</p>

Appendix I

Literature Review Matrix

Author(s)	Title	Year of Publication	Aim	Study Design	Level of evidence	Sample	Findings	Limitations
Beeson, T. & Davis, C.	Urinary Management With an External Female Collection Device	2018	To evaluate the effectiveness of an external female urinary collection device in 3 patients in their management of urinary incontinence	Case study	Level VI	n=3	Patient #1 found that she was able to sleep at night as before, she was having to urinate every 30-45 min at nighttime prior to the use of this device. Patient #2 was admitted to the ICU for septic shock and was incontinent. Nurses tried to avoid using an indwelling urinary catheter due to the risk of infection and the female external urine collection	Poor level of evidence, small sample size

							<p>device was used and found to keep patient #2 from waking continuously at night. Patient #3 had a pre-existing pressure wound that prompted for the female external urine collection device and allowed her skin to stay dry. However, she eventually needed an IUC because she started to become incontinent with stool. Female external urine collection device is a possible alternative to the indwelling urinary catheter. Nurses also were satisfied</p>	
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							with the use of the device as it decreases the need for frequent linen changes, its ability to record urine output and keeps patients at low risk for skin break down. Patients also reports satisfaction with this device and increased comfort	
Beeson, T., Davis, C., & Vollman, K.	Presentation Number EPOP-17 - Chasing Zero Catheter Associated Urinary Tract Infections (CAUTIs) through Implementing a Novel Female External Urine Collection Device in a Tertiary Academic Surgical Intensive Care Unit (SICU)	2018	to decrease CAUTIs in the SCIU by implementing a female external urinary catheter	quality improvement project	Level VI	N/a - sample size not reported	IUC days decreased by 9% during the 6-month pilot phase. CAUTI rates during the pilot was 2.55 in 2016 and decreased to	sample size not indicated, poor level of evidence since it is a quality improvement project

							0.70 in 2017 for a reduction of 27%. The SIR ratio decreased from 1.395 to 0.381 in the 6-month pilot	
Chenoweth, C., & Saint, S.	Preventing Catheter-Associated Urinary Tract Infections in the Intensive Care Unit	2013	To describe CAUTI prevention strategies	Report	Level VII	N/a	This report describes several prevention strategies for CAUTI: early removal, alternatives to indwelling catheters, avoid insertion of indwelling catheters if possible, proper techniques.	poor level of evidence, study is more of a report

<p>Häggman -Laitila, A., Mattila, L.-R., & Melender, H.-L.</p>	<p>A systematic review of the outcomes of educational interventions relevant to nurses with simultaneous strategies for guideline implementation</p>	<p>2017</p>	<p>to systematically review the literature on outcomes of educational interventions related to nurses with guideline implementation</p>	<p>systematic review</p>	<p>Level I</p>	<p>n=13</p>	<p>APN knowledge increased and was statistically significant from pretest to post-test in a study by Choma and McKeever on using a web-based designed continuing education internet intervention for HPV and cervical cancer screening. In a CLABSI study by McCaskey using education as an intervention for CLABSI prevention found that the mean total compliance score of the post-intervention was significantly higher.</p>	<p>search included only 3 databases, mixed quality of the articles, multiple methods were used for implementation of guidelines</p>
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							Overall, nurses reported improvements in their knowledge base, increased confidence in using the guidelines and changing practices.	
Hu, F.-W., Yang, D.-C., Huang, C.-C., Chen, C.-H., & Chang, C.-M	Inappropriate use of urinary catheters among hospitalized elderly patients: Clinician awareness is key.	2015	to investigate incidence, reasons, risk factors and outcomes for inappropriate use of urinary catheters in hospitalized elderly patients	prospective study	Level IV	n=321	418 urinary catheters were used, 1958 urinary catheter-days were counted and 1035 urinary catheter days (52.8%) were considered as inappropriate. Inappropriate use was mostly occurred in women and surgical use. Convenience of care was the most common reason for inappropriate	not every patient in the study had urinary cultures after catheterization, incidence of bacteriuria could not be confirmed and thus CAUTI might be underestimated. Also daily follow ups regarding early catheter removal may have biased the data such that CAUTI rates may also be

							use of urinary catheters.	
Laan, B. J., Spijkerma n, I. J. B., Godfried, M. H., Pasmooij, B. C., Maaskant, J. M., Borgert, M. J., ... Geerlings, S. E.	De-implementation strategy to Reduce the Inappropriate use of urinary and intravenous Catheters: study protocol for the RICAT-study	2017	to reduce the use of urinary and intravenous catheters with an inappropriate indication to reduce catheter-related complications	Quasi-experimental	Level III	n=210-820	No hard data available as this article only describes the study design. However, this study describes the effectiveness of de-implementation strategies in a bundle format (restrict the insertion of urinary catheters,	No control group, unable to evaluate individual intervention, study did not occur yet so there are no exact results in regard to the success of this study

							recommend prompt removal, having a local champion to be responsible for the interventions in the unit).	
Mattia, L., Okumura, R., Garcia R., Reynolds, P., & Eckert L.	Innovation on Reducing CAUTI's	n/a	to determine the effectiveness of the PureWick female external urinary catheter in reducing CAUTI and to assess patient satisfaction and RN satisfaction with the device	Report	Level VII	n=600	Over 600 women used PureWick and CAUTI's were eliminated using this device. A TCMC hospital survey amongst 15 RNs, 100% said that it is easy to place the device and maintain, 100% said that it reduces labor and saves time, 93% said that it improves patient dignity, 100% said that it increases patient satisfaction, 100% said that it allows	hospital-based study, poor level of evidence.

							earlier Foley catheter removal, and 100% said that it reduce the risk of moisture associated skin damage	
Newton, C., Call, E., and Chan, K.	Measuring Safety, Effectiveness and Ease of Use of the PureWick in the Management of Urinary Incontinence in Bedbound Women: Case Studies	2016	To evaluate the effectiveness, ease of use of the PureWick	Case study	Level IV	n=16	No instances where symptomatic UTI developed using PureWick. No reported episodes in discomfort. 1843 days of PureWick use by 16 patients, no skin problems/rashes or pressure sores attributable to PureWick.	Small sample size, low level of evidence

<p>Reilly, L., Sullivan, P., Ninni, S., Fochesto, D., Williams, K., & Fetherman, B.</p>	<p>Reducing Foley Catheter Device Days in an Intensive Care Unit: Using the evidence to change practice</p>	<p>2006</p>	<p>To compare evidence- based guidelines for the prevention of urinary tract infections, to minimize indwelling urinary catheter use and decrease the incidence of catheter- associated urinary tract infections</p>	<p>quality improvement project</p>	<p>Level VI</p>	<p>n=124</p>	<p>6% of Foley catheters were removed pre- implementatio n and 20% of Foley catheters were removed post- implementatio n. CAUTI rates decreased by 33% with a decrease of 408 Foley catheter days.</p>	<p>small sample size, low level of evidence</p>
<p>Saint, S., Meddings, J., Calfee, D., Kowalski, C.P., & Krein, S.L.</p>	<p>Catheter-associated Urinary Tract Infection and the Medicare Rule Changes</p>	<p>2009</p>	<p>To discuss the CMS rule changes regarding payment of CAUTI and to offer guidance to clinicians and hospital administrators</p>	<p>Narrative review</p>	<p>VII</p>	<p>N/A</p>	<p>For discharges occurring on or after October 1, 2008, hospitals paid by the Inpatient Prospective Payment System will not receive additional payment for CAUTI when acquired during hospitalization</p>	<p>Level of evidence</p>

<p>Scott, R. A., Oman, K. S., Makic, M. B. F., Fink, R. M., Hulett, T. M., Braaten, J. S., ... Wald, H. L.</p>	<p>Reducing Indwelling Urinary Catheter Use in the Emergency Department: A Successful Quality-Improvement Initiative.</p>	<p>2014</p>	<p>evaluate the effectiveness of implementing multidisciplinary education and deploying utilization tools aimed at reducing the inappropriate insertion of indwelling urinary catheters in the emergency department</p>	<p>quality improvement project</p>	<p>Level VI</p>	<p>n=? Was not explicitly stated (min of 25, max of 35)</p>	<p>The decision support tool, educational sessions, product stocking changes were made, and EMR document changes led to 2.49% absolute reduction of catheterizations in admitted patients. 84% of staff reported the intervention changed the way they approached bladder management. There was a decrease in inappropriate use of IUCs (35% prior to intervention and 24% post-intervention</p>	<p>only 53% of nursing staff attended one educational session, 78% completed the electronic educational module. Outreach to physicians and PAs were limited. Poor level of evidence.</p>
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<p>Thomas, K.L</p>	<p>Reduction of Catheter-Associated Urinary Tract Infections Through the Use of an Evidence-Based Nursing Algorithm and the Implementation of Shift Nursing Rounds: A Quality Improvement Project</p>	<p>2016</p>	<p>implement a nurse-led evidence-based practice change to reduce CAUTIs in a cardiac intensive care and step-down unit.</p>	<p>quality improvement project</p>	<p>Level VI</p>	<p>n/a</p>	<p>Fewer CAUTIs occurred after implementation (p=0.009) and CAUTI rate declined (p=0.005). The # of IUC days and catheter utilization rates did not differ post-implementation. The mean compliance rate was 91% for the 3x daily IUC rounds. # of IUC days were reduced.</p>	<p>Nurses were not comfortable removing IUCs without physician order despite the implementation of the nurse driven protocol algorithm was in place 1-year prior before the implementation of the QI project. Poor level of evidence</p>
<p>Wu, Y., Brettle, A., Zhou, C., Ou, J., Wang, Y., & Wang, S.</p>	<p>Do educational interventions aimed at nurses to support the implementation of evidence-based practice improve patient outcomes? A systematic review</p>	<p>2018</p>	<p>review the literature on the change in patient outcomes following education as an intervention to support nurses in implementing EBP and the methods used to determine whether EBP education</p>	<p>systematic review</p>	<p>Level I</p>	<p>n=18</p>	<p>A study by Haggman-Laitila et al (2016) found that education as an intervention on clinical nurses were effective in increasing nurses' knowledge of evidence-based practice and skill. Yost et al (2014)</p>	<p>Study designs varied in this systematic review; some studies had incomplete data especially on patient outcomes</p>

			improves patient outcomes				found that using knowledge translation strategies on nurses to support evidence-based practice benefits patient outcomes.	
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