

**EDUCATIONAL INTERVENTION: IMPROVING LONG-TERM CARE NURSING
STAFF COMFORT WITH UTILIZING BLADDER SCANNER**

Melissa S. O'Bryant, BSN, RN

A Project Report Submitted to the Faculty of The School of Nursing at

The University of North Carolina at Greensboro

in Partial Fulfillment

of the Requirements for the

Doctorate in Nursing Practice

Greensboro

2023

Approved by:

Kathryn Lawrence, DNP Project Team Leader

Brooke Shaw, DNP Project Team Co-Leader

Wanda Williams, DNP Program Director

Table of Contents

Abstract	3
Background and Significance	4
Purpose	6
Review of Current Evidence	6
Conceptual Framework/Theoretical Model	13
Methods	13
Design	14
Translational Framework	15
Project Implementation	16
Data Analysis	18
Results	19
Discussion	23
Conclusion	26
References	28
Appendices	33
Appendix A: Site Approval	
Appendix B: Educational PowerPoint	33
Appendix C: Educational Materials for Site	
Appendix D: Feedback Survey	35
Appendix E: PDSA Model	36

Abstract

Background: According to the CDC, UTIs result in 20-30% of illnesses reported by long-term care institutions (CDC, 2017). One must consider multiple factors regarding the elderly population and urinary retention vs. UTIs. Intermittent catheterizations cause pain, discomfort, and complications leading to hospitalizations. Among the elderly, specifically the mentally impaired, there is an increased risk for urinary retention or UTIs.

Purpose: This project enhanced the staff's knowledge about bladder ultrasound technology to reduce urinary tract infections and unnecessary intermittent catheterizations.

Methods: This was a quality improvement (QI) using the Plan-Do-Study-Act (PDSA) Model to identify if the education provided to the nursing staff on the use of bladder scanners would prevent unnecessary intermittent catheterizations, thus decreasing urinary tract infections (UTIs).

Results: During the eight weeks of the data collection, 3134 (62%) staff members (RN, LPN, CNA's/CNAs) in the DNP project LTCF site participated in this staff education. The behavioral intention to use the bladder scanner improved slightly, although not statistically significant, decreasing unnecessary intermittent catheterization and UTIs.

Recommendations and Conclusions: The bladder scanner is recommended for patients with urinary incontinence among the elderly within all LTCFs because of the increased risk of UTIs. Based on the results of this QI project, the use of the bladder scanner yielded a decrease in UTIs.

Background & Significance

Urinary tract infections (UTIs) are a common diagnosis among patients in long-term care facilities. From diagnosis to treatment, this widespread infection is challenging to recognize. This widespread infection is challenging to recognize from diagnosis to treatment when many long-term care patients are asymptomatic except for voiding issues. According to the Centers for Disease Control (CDC), UTIs result in 20-30% of illnesses reported by long-term care institutions. In 2018, roughly 5,000,000 aged 65 years and older were among those who visited the emergency room for UTI diagnosis and treatment (CDC, 2018). Change-related alterations to the genitourinary tract, comorbid diseases such as neurogenic Bladder, and the necessary equipment to regulate bladder voiding are risk factors for developing bacteriuria and UTI in LTC residents. The use of intermittent in/out catheterizations is one example of equipment that is used for bladder regulation and voiding assistance. Asymptomatic bacteriuria can have a 25-50% incidence in LTC patients.

Although the frequency of symptomatic UTIs is decreasing, it still accounts for a considerable proportion of infections in long-term care facilities (LTCF) (CDC, 2017). According to Medicare, the national average of UTIs in long-term care residents is 2.5%, the state average for North Carolina is 3.2%, and the average number of UTIs in the facility on which my project is based is 5.6% (*Medicare.gov*, 2021). Therefore, the percentage of UTIs within the facility alone is much higher than the national and state UTIs among LTC residents.

Among the elderly, specifically the mentally impaired, there is an increased risk for urinary retention or UTI. This population of patients cannot always verbally express pain or urinary symptoms to providers or family members (CDC, 2017). One effective tool that is underutilized is a bladder scanner or bladder ultrasound machine (Agency for Healthcare

Research and Quality [AHRQ], 2017). This device, a prophylactic non-invasive procedure that reduces the need for catheterization, is an effective way to prevent unnecessary invasive measures for urinary retention. Effectively prevents unnecessary invasive urinary retention measures. The bladder ultrasound is simple, quick, and can aid in detecting postoperative abnormalities such as urine retention or post-void residual (PVR). Other applications for bladder scanners include detecting a clogged Foley catheter, assessing bladder condition and function following the removal of an indwelling urinary catheter, and using it as a feedback aid in bladder training. Most importantly, there are no known adverse effects of bladder scanning. It is merely a non-invasive preventive technique that does not cause pain or necessitate any sedation/intubation.

Furthermore, failing to scan a patient's Bladder can increase the patient's discomfort and pain due to urinary retention. Choosing a more invasive procedure, such as intermittent catheterization, is more painful for the patient and raises the risk of introducing more bacteria into the Bladder, increasing the likelihood of UTIs. Urinary tract infections can have severe consequences and require hospitalization in the elderly population. Sepsis, secondary to UTI, is one of the leading causes of hospitalizations and treatment in the emergency room for patients who are nursing facility residents (*Bladder Scanning: The Benefits*, 2020).

With this in mind, the Rosie bladder scanner is available for use at a 100-bed long-term care facility with approximately 80-90 patients. A Nurse Practitioner (NP) who works at the long-term care facility routinely utilizes the scanner; however, many of the nursing staff do not. This may be due to the lack of education and training on the device and the decreased confidence in utilizing with the bladder scanner. The absence of consistent use of this tool could be one of the reasons unnecessary in/out catheterization continues, contributing to their residents

developing UTIs. This deficiency in education and confidence in the use of using a bladder scanner often leads the staff to use last void times to perform in/out catheterization in patients. By increasing the knowledge/confidence of the nursing staff regarding bladder scanner utilization, non-invasive UTI prevention techniques can be implemented to improve the use of the Rosie bladder scanner and, therefore, decrease the frequency of unnecessary in/out catheterization by the nursing staff.

Purpose

This project enhanced the staff's knowledge about bladder ultrasound technology to reduce urinary tract infections and unnecessary intermittent catheterizations. The specific goals of this project included 1) a general overview of urinary tract infections among the elderly, 2) an evaluation of urinary tract infections in patients within the LTCF, 3) bladder scanner use, 4) bladder scanner used in the prevention of UTIs in LTCF 5) assessment of nurses' knowledge of bladder scanners and their use in facility 6) educating nurses (RN, LPN, CNA) about the use of bladder scanners.

Literature Review

This literature review mainly used the University of North Carolina Greensboro (UNCG) online library database. The included links and search engines were CINAHL, PubMed, and Google Scholar. The search was limited to a five-year timeframe for most sources, except for a few seminal and valuable articles. While gathering articles During my search for this project, a few articles older than 2017 or greater than five years were accepted due to the limited resources available in the use of more than five years were accepted due to the limited resources available in using bladder scanners in long-term care settings and the advantages of bladder scanner utilization to prevent UTIs. Some key terms used for my search include long-term care, Long-

term care facilities, UTI, Catheterization, Unnecessary catheterizations, Bladder scanners, Bladder ultrasound, benefits of bladder scanner, and CAUTI. All literature reviews were limited to publications written in English. These articles are further refined to focus on data collected in long-term care facilities, urinary incontinence, unnecessary catheterization, cost of UTIs, nursing management/education, and full-text availability.

It was noted in the literature that urinary tract infections, bladder dysfunction, and urinary incontinence are prevalent in long-term care facilities, affecting the older adult population aged 65 and above. Bladder alterations caused by aging can increase UTI incidence. In general, older adults generally have an atypical presentation when a UTI is manifesting, making it more difficult to detect. Although the frequency of indwelling catheters in LTCF is lower than in acute care, it is still one of the leading causes of UTIs, leading to complications such as cystitis, bacteremia, and septic shock (CDC, 2017; Meddings et al., 2017). Because UTIs in LTCF can result in hospitalizations due to complications that stem from the initial urinary infection, the nursing staff must be informed and confident in the use of using the bladder scanner. This includes information on the benefits of its use for the prevention of preventing unnecessary catheterizations and the avoidable consequence of UTIs in their patients. The articles' main themes include urinary tract infections in the elderly, urinary tract infections in LTCF patients, bladder scanner use, bladder scanner used in the prevention of UTIs in LTCF (effectiveness and importance), assessing nursing staff knowledge of bladder scanners and their use in the facility, and educating nurses (RN, LPN, CNA) about the use and of bladder scanners (Protocols, instructions on operation, confidence level).

Urinary Tract Infections Among Elderly

Urinary Tract Infection (UTI) is one of the most prevalent illnesses among the elderly. Urinary tract infections (UTIs) account for 25% of all infections in elderly adults and, account for an estimated 7 million office visits, 1 million emergency department visits, and 100,000 hospitalizations per year (Cortes-Penfield et al., 2017). The aging process is a risk factor for UTIs. This risk is most likely complex, with increased urine incontinence and urinary retention rates, hospitalizations and associated urinary catheterizations, long-term medical institutionalization, and immunological senescence all playing a role (Cortes-Penfield et al., 2017). UTI in the elderly is readily controlled and seldom causes problems when treated early and effectively. However, a UTI can have significant health repercussions, including lifelong kidney damage and sepsis, leading to hospitalization if left untreated. In rare cases, an infection can enter the circulation through the kidneys and cause sepsis, a potentially fatal illness. As a result, early detection of symptoms, testing, diagnosis, and treatment of UTIs are critical. Atypical symptoms often linked with UTI in the elderly, such as falls, increasing incontinence, functional and cognitive deterioration, and foul-smelling urine, indicate the differences in symptoms among older adults (Chu & Lowder, 2018). Although UTI features vary across nursing home patients and community-dwelling older women, one study found that dysuria, urine modification (color, odor, hematuria), and mental state were substantially linked with positive urine culture (Chu & Lowder, 2018; Komagamine et al., 2022).

Urinary Tract Infections in Patients of LTCF

The urinary tract is a benchmark of healthcare-associated infections, accounting for 20-30% of illnesses reported by long-term care facilities (LTCFs). Age-related abnormalities to the Bladder and kidneys, comorbidities leading to central nervous system impairment, and equipment necessary to regulate bladder voiding are risk factors for developing bacteriuria and

UTI in LTC residents. Asymptomatic bacteriuria can have an increased incidence of 25-50% in LTC individuals, thus making it harder to diagnose (CDC, 2017). A vast range of long-term care institutions cares for diverse patients. Subjects above 65 years of age who require ongoing residential care due to functional or mental disability are more likely to have complicated infections (Nicolle, 2014). The management method varies depending on whether the UTI is uncomplicated or complicated. This also involves urinary tract functional or structural disorders, such as the requirement of an indwelling catheter generated by urine retention. Because of their comorbidities, mental condition, and aging-related changes in urine function, most residents in long-term care facilities are deemed to have complex infections requiring closer attention and monitoring (Nicolle, 2014). Furthermore, the prevalence of indwelling urinary catheters accounts for 80 % of UTIs; however, this frequency can be decreased. Utilizing a portable bladder scanner or ultrasound equipment to examine bladder function is a safe, non-invasive technique to reduce unnecessary catheterizations (Brusch & Bronze, 2021; Widdall, 2015).

Bladder Scanner Use

A portable bladder ultrasound scanner provides a non-invasive, quick, and painless means of determining urine volume in the Bladder. It is used to evaluate individuals who have complaints of urinary dysfunction and bladder emptying, and it has surpassed urinary catheterization as the preferred approach (Prieto, 2016). The bladder scanner provides the exact urine volume measurement in the patient. The scanner requires minimum training and provides evidence to support the need to catheterize patients with acute urinary retention. Further, the information on urine volume can also prevent needless catheterization. .

Conversely, catheterization is an intrusive, time-consuming, and painful procedure that increases the risk of urinary tract infection (UTI) (Prieto, 2016). There are several indications for

using the bladder scanner: Urinary retention (UR) or inability to void, incomplete emptying of the Bladder, post-void residual following catheter removal, and decreased urine output. Some clinical signs and symptoms to assess that may warrant performing a bladder scan on an individual include: urinary frequency, reduced urine output, incontinence, unable to void, and confusion among the elderly (Widdall, 2015).

Financial Impact of Bladder Scanner Use

The average cost of intermittent catheterization supplies could cost as much as \$4,400 a year, and the cost of supplying a bladder scanner is around \$8,000. However, if facilities can save on supplies, the bladder scanner cost will cover itself within 2-3 years (Prieto, 2016). In one study, the staff utilized the bladder ultrasound machine for residents with UI before initiating intermittent catheterization. It avoided 1,392 catheterizations within the first year, indicating that the bladder scanner measures an individual. It was associated with a cost savings of \$2,7845 in catheter supplies. Also, the savings related to the prevention of UTIs and their treatment expenses were \$45,900 (Annals of Long-Term Care, 2015). Unfortunately, even though an evaluative study incorporating bladder scanners into LTC highlights positive evidenced based practice outcomes, the information is only sometimes translated into practice. Catheterization, which can cause unintentional damage to the resident while raising the risk of UTIs, is a standard treatment in UI management in older adults in LTC (Brusch & Bronze, 2021; Christianson et al., 2021). In the facility in which the project was proposed, the cost of intermittent catheter supplies runs \$1.55 for each use. The facility does approximately 280 intermittent catheterizations monthly, costing them about \$433.00 in supplies. The cost yearly would be \$5,208. If the use on

of unnecessary intermittent catheters could be cut by one-third, this could save the facility \$1,718.00 a year.

Bladder Scanner Use in the Prevention of UTIs in LTCF

Bladder dysfunction and urine incontinence (UI) are common in nursing homes. The frequency of UI among long-term care residents is believed to be between 45-70% (Annals of Long-Term Care, 2015). Bladder ultrasound scanners can precisely identify urine volume and retention while posing a lesser risk of infection and minimal discomfort than catheterization. Despite evidence-based research proving the benefits of bladder ultrasound scanners, nursing homes have slowly adopted this device (Annals of Long-Term Care, 2015). One article mentioned limitations such as minimal training on using scanners and inadequate education on continence care. Other factors identified included the ease of access to equipment and the lack of policies, which made it easy to avoid using bladder scanners (Christianson et al., 2021).

In like manner, administrators also indicated that the scanner's location and accessibility directly impacted utilization and may have influenced a staff member's perceived ease of use and the cost-effectiveness of the bladder scanner and scanner maintenance (Annals of Long-Term Care, 2015). Critical outcomes of integrating bladder scanners within the long-term care facility can reduce the cost associated with catheterization materials and treatment of infectioninfection treatment and also avoid hospitalization costs. It is recommended that an LTC facility keep changes small and involve frontline staff and leadership who are interested in improving care in order to make changes that are effective (Agency for Healthcare Research and Quality [AHRQ], 2017). Bladder scanner/ultrasound machines can reduce unnecessary catheter use, decrease infection risks, and minimize patient discomfort during the procedure, making it easier to introduce into LTCF (Annals of Long-Term Care, 2015)..

Assessing Nurse's Knowledge of Bladder Scanners and Their Use in the Facility

All healthcare team staff play a critical role in delivering high-quality care to patients in skilled and long-term care facilities. Nursing staff education on UTI prevention and early detection can minimize the prevalence of infection in older adults (Viner & Gautam, 2020; Christianson et al., 2021). Even though this is a common issue, the nursing staff needs more fundamental expertise regarding urinary incontinence and its management. Due to a knowledge deficit, nurses cannot implement the essential procedures to assess and begin intervention in these vulnerable patients (McDaniel et al., 2020). Barriers to providing high-quality care to LTC patients are lack of time, limited staff, and low severity of urinary incontinence in the patient care plan, which can cause negative attitudes toward treatment goals and interventions (Christianson et al., 2021; McDaniel et al., 2020; Ostaszkiwicz et al., 2020). Before implementing bladder scanners in LTCF facilities; nursing care staff education and training is an essential technique for improving staff capability to assess, problem-solve, and identify appropriate interventions for UTIs before they lead to hospitalization (Christianson et al., 2021; Jorge et al., 2017; McDaniel et al., 2020; Viner & Gautam, 2020).

Educating Nurses (RN, LPN, CNA) About the Use of Bladder Scanners

Indwelling urinary catheters account for roughly 80% of UTIs (Brusch & Bronze, 2013). However, their prevalence can be minimized by reducing needless catheterizations and monitoring bladder function with a portable bladder ultrasound (Christianson et al., 2021). Increased care complexity, including UI, will influence the types of personnel needed (RN, LPN, and CNAs) and the training required to meet the greater care demands of LTC residents (Christianson et al., 2021). Utilizing bladder scanners and enhancing nursing care staff training might improve present techniques for controlling UTI in long-term care facilities for frail older

persons. The amount of knowledge concerning preventative measures influences continence treatment and the usage of portable bladder scanners by nursing care professionals. Staff education regarding continence care, using bladder scanners, and exploring scopes of practice are essential for appropriate assessment, management, and treatment of continence in LTC settings (Christianson et al., 2021).

Conceptual Framework

Bladder disorders and urinary incontinence (UI) are common in nursing homes. It is estimated that between 45% and 70% of long-term care, residents are affected by UI. Bladder ultrasound scanners can correctly identify urine volume and retention compared to catheterization, posing a reduced infection risk and causing minimal to no discomfort. Despite evidence-based research proving the benefits of bladder ultrasound scanners, nursing homes have been hesitant to implement this equipment (Annals of Long-Term Care, 2015).

The Technology Acceptance Model (TAM) defines how people accept and embrace technology and will be the foundation for implementing this project. TAM was originated by Davis in 1989 (Davis, 1989). Several studies that evaluate individual technology acceptance behavior in various information system structures have thoroughly examined and validated TAM. TAM stresses two significant factors that affect a new technology's acceptance: (1) perceived *applicability*, defined as the extent to which the user believes technology will increase personal effectiveness, and (2) perceived *usefulness*, defined as when the user feels the technology will be straightforward. The TAM was implemented to help utilize and establish principles that drove the analysis to understand the obstacles and causes that led LTC facilities to

embrace technology and key stakeholders' opinions on technology implementation techniques. Bladder scanners or bladder ultrasound devices can guide key stakeholders with residents with urine retention, thus helping reduce UTIs among long-term care residents (Annals of Long-Term Care, 2015).

Methods

In order to improve the quality of care for patients at a long-term care facility, the staff's awareness of bladder ultrasound technology must be prevalent to prevent urinary tract infections and avoidable intermittent catheterizations. This project's particular goals included a general review of urinary tract infections in the elderly, examining urinary tract infections in LTCF patients, utilization of a bladder scanner, the use of a bladder scanner to prevent UTIs in LTCF patients, evaluating nurses' understanding of bladder scanners and their application in the facility, and teaching nurses (RNs, LPNs, and CNAs) how to utilize bladder scanners). The nursing care staff that was selected for education consisted of RNs, LPNs, and CNAs. The director helped to recruit the LTC team via email, overhead announcements, and invitation signs around the facility. In this DNP project, the nursing staff was assessed first, focusing on their comfort level and training experience on bladder scanners. Then the onsite bladder scanner was introduced in person, and educational materials were provided via PowerPoint presentation. At the end of the educational intervention, a start-to-finish laminated card was affixed to the bladder scanner machine in case any questions arose during use.

All nurses, but especially those in their mid-to-late careers, were aware that best practices and patient care standards were constantly evolving, and there was a desire for access to information through training and education in order to provide the best possible care to patients. At this point, nurses saw continuing education as an investment in their expertise that

would improve the care they could provide to their patients; they were disappointed that management did not see this as essential. Nurses did not believe that employers prioritized training and education, particularly for mid to late-career nurses (Price & Reichert, 2017).

Design

This Doctorate of Nurse Practitioner project was a quality improvement plan focusing on education and different evaluation options for ruling out urinary retention in residents of LTC facilities. The aims were to minimize the usage of intermittent catheterizations and limit unnecessary identification of asymptomatic bacteremia. This was completed by developing, presenting, and demonstrating strategies concerning UTIs and employing bladder scanners or ultrasound machines to evaluate urinary retention instead of intermittent catheterizations.

Transitional Framework

The Plan Do Study Act (PDSA) model (Shewhart and Denning, 1993), a quality-improvement method, aids in introducing a new program or technology into a complex setting, such as long-term care facilities. The PDSA was originated from the industry discipline and originated from the industry discipline and was formulated by Walter Shewhart and Edward Deming of to describe iteration and reiterate the change process (Taylor et al., 2014). The PDSA cycle is an acronym that stands for testing a change by making a strategy to try the change *Plan*, carrying out the test *Do*, watching and learning from the results *Study*, and determining what changes should be made to the test *Act* (Plan-Do-Study-act (PDSA), 2022). In this DNP project, the *Plan* was to educate the staff of an LTCF on the importance of utilizing a bladder scanner to decrease the incidence of unnecessary catheterizations, therefore reducing UTI instances. The *Do* was to educate the staff on UTI symptoms among the elderly and use the bladder scanner at their LTCF. The *Study* stage of the PDSA acknowledges the staff's use of the bladder scanner to

decrease the number of unnecessary catheterizations to decrease UTI events, thus dropping the facility's overall UTI percentage. The *Act* implements bladder scanners among staff to prevent unnecessary catheterizations and UTIs.

Population

The population includes all licensed nursing care professionals interested in participating in the study by contacting the lead director. Those who met the selection criteria, such as RN, LPNs, and CNAs, were asked to participate. This criterion was determined because these staff members have more direct patient care daily. There are approximately 50-60 fifty-sixty staff members. Approximately 50-60 staff members are combined on the day and night shifts. The inclusion criteria were consistent with RNs, LPNs, and CNAs that provided direct patient care. The exclusion criteria were any non-clinical staff member, such as administration, family members, and environmental services. Physical therapy, occupational therapy, X-ray technicians, and chaplains were excluded.

Setting and Sample

One long-term care facility served as the study site for this project. It is a nonprofit, 90-bed facility in North Carolina specializing in skilled nursing, disease management, restorative care, and custodial care. The sample was a convenience sample of nursing staff who provided direct patient care, such as RN, LPN, and CNAs. These staff members were invited to voluntarily participate in the education/knowledge information concerning UTIs in elder older adults, including instruction and utilization of bladder scanners.

Implementation and Intervention

Before the focus groups began, informed consent was acquired to accept educational materials on the signs and symptoms of acknowledging UTIs among the elderly.(elderly.

(Appendix A) A PowerPoint presentation was provided to the focus groups. Staff participation was optional but was essential in carrying out the staff participation to reduce unnecessary catheterizations and UTIs. It was postulated that completing the knowledge and skills part of the education would help the staff understand and feel at ease utilizing a bladder scanner on residents.

Once the UNCG IRB approved this project, the planned implementation was set up on a date at the LTCF, August – October 2022. This time period was adequate to ascertain the understanding of UTIs among the nursing staff and to educate them on using the bladder scanner/ultrasound within the facility. The education was provided in the form of a PowerPoint presentation. It included (1) the signs and symptoms of UTIs among the elderly, (2) why it was essential to implement before initiating in/out catheterization; , (3) participants were also given a laminated start-to-finish instruction sheet, which was attached to the bladder scanner as a resource for any questions that may arise during the scanning procedure. (Appendix)

Instruments

Education materials for the nursing staff were presented in a 3-4 slide PowerPoint lasting approximately 10 minutes. (Appendix) A four-question pre and post-test survey was conducted on the bladder scanner's use/ease/beliefs. The survey was guided by using the TAM model. However, Survey Monkey never used and created the actual questions (Davis, 1989). Over the last three decades, some theoretical models have been used to investigate technology acceptance and use. The technology acceptance model (TAM) using one of the most widely used (Agudo-Peregrina et al., 2014; Annals of Long-Term Care, 2015; Jiang et al., 2021).

Data Collection

Procedures.

Statistics were gathered approximately six months prior at the LTCF of intermittent catheterizations and the number of UTIs monthly before utilizing a bladder scanner by the facility by the care coordinator and infectious disease. The nursing staff who employed the bladder scanner tallied the times the bladder scanner was used to prove if the change was possible. The tallied sheet was done anonymously and kept securely by the NP on site. Also, 4-8 weeks after utilizing the bladder scanner, repeated statistics were done on intermittent catheterizations, monthly UTIs, and hospitalizations within the LTCF. The goal was to see if educating the elderly on the signs and symptoms of UTIs, preventing in/out catheterization, and using bladder scanners helped to reduce the number of intermittent catheters and, thus, UTIs. Microsoft excel was used to create a spreadsheet that charted the statistics of before and after educating the staff, utilizing the bladder scanner, UTIs among patients, number of in/out catheterizations, and hospitalizations.

The data collected was stored in a password protected personal computer/laptop and not shared with any of the stakeholders during evaluation. The laptop was in the possession of the PI at all times, or locked in a secure location. The data collection documents were secured in a locked file that did not allow access to anyone not directly involved in the DNP project. The data was not viewed or analyzed in a public place such as a coffee shop or library where confidentiality could not be maintained. Data was reviewed only by UNCG faculty involved in the project including the statistician.

Data Analysis

Data were analyzed using a two-sample *t*-test and bar charts to distinguish the difference between the staff's utilization of the bladder scanner before and after the education was

implemented. Since there were no unique identifiers for the pre and post-data, the sample was treated independently, and a two-sample *t-test* was most beneficial for results. The one-tailed *p*-value is 0.311866, and the two-tailed *p*-value was $2 \times 0.311866 = 0.6237 > 0.05$; therefore, I failed to reject the null hypothesis, indicating that I did not have convincing evidence to conclude that there was a statistically significant difference in the outcome from pre to post educational intervention on the utilization of bladder scanners.

Qualitative data was collected using a four questions survey (Appendix D) and was done anonymously and voluntarily by the nursing staff (CNA, LPN, RN) with direct patient care. The pre and post survey (post-survey included the behavioral intention to use of the bladder scanner, perceived usefulness, perceived ease of use, and the staff's intention to use the bladder scanner. The survey was administered twice: once before the education, between August and September, and again after the teaching was implemented, about 4-8 weeks later.

Results

A total of 3134 (62%) staff members (RN, LPN, CNA's/CNAs) in the DNP project LTCF site participated in this staff education. The responses were analyzed by a pre and post survey (post-survey on the behavioral intention to use of the bladder scanner, perceived usefulness, perceived ease of use, and the staff's intention to use the bladder scanner before and 4-8 weeks after the education. The education was held voluntarily on two dates, one during the day and one during night shifts. Of the eligible participants, 20 participated in the pre-survey, and 11 participated in the post-survey. It should be noted that not all of the participants were the same in the surveys conducted before and after the study. The results were gathered all at once, which may explain the decline in participation in the post-survey results.

Table 1 below shows the staff response, in percentages, to questions concerning the ease of use with bladder scanners, before and after the educational secessions.

Table 1

Chart 1: *Pre/post education survey (ease of use) on staff education on the bladder scanner*

1. Behavioral intent to use the bladder scanner	Before Education	After Education
Very likely	15%	18%
Likely	45%	9%
Neither likely nor unlikely	25%	36%
Unlikely	5%	0%
Very unlikely	10%	36%
2. Perceived usefulness of bladder scanner		
Very likely	10%	45%
Easy	45%	9%
Neither east Nor difficult	25%	27%
Difficult	20%	0%
Very difficult	0%	18%
3. Perceived ease of use		
Very easy	10%	45%
Easy	40%	18%
Neither easy nor difficult	35%	18%
Difficult	15%	0%
Very difficult	0%	18%
4. Intention to use the bladder scanner		
Very Likely	15%	27%
Likely	60%	18%
Neither likely nor unlikely	5%	18%
Unlikely	15%	0%
Very unlikely	5%	36%

Respondents before education n = 20; respondents after education n=11.

The qualitative findings of the content analysis revealed that, while bladder scanners are essential to use, their use depends on the intention and behavior to use the bladder scanner. The percentage of the usefulness and perceived ease of use increased after the education; however, the behavior and intention to use the bladder scanner after education either neutralized to neither likely nor unlikely or decreased. For question one, there was a 3% increase in the staff's "very likely" after-education. For question two, there was a 35% increase in the staff's "very likely" perception of the usefulness of the bladder scanner after the education intervention. For question three, there was also a 35% increase in perception within the staff as "very likely" that there was ease in using bladder scanners after the education was given. Lastly, question four had a 12% increase in the participant's intention to use the bladder scanner after the instruction.

Table 2

t-Test: Two-Sample Assuming Equal Variances

	<i>Total of Pre-test</i>	<i>Total of Post-test</i>
Mean	14.05	14.54545
Variance	13.73421	17.47273
Observations	20	11
df	19	10
F	0.786037	
P(F<=f) one-tail	0.311866	
F Critical one-tail	0.420533	

The one-tailed p -value is 0.311866, and the two-tailed p -value was $2 \times 0.311866 = 0.6237 > 0.05$; therefore, I failed to reject the null hypothesis, indicating that I did not have

convincing evidence to conclude that there is a statistically significant difference in the outcome from pre to post educational intervention. Of note, due to poor response rate, data cannot be generalized to other long-term care facilities.

To summarize, in August 2022, the UTI number was 12; however, in September, it dropped to five (58.33% decrease), and in October, the UTI number was four (66.67% decrease). The in/out catheterizations also dropped from seven a day to three. Additionally, the facility saved approximately 66.67% cost of supplies in September and October 2022.

The qualitative findings of the content analysis revealed that, while bladder scanners are important to use, their use is dependent on the intention and behavior to use the bladder scanner. The percentage of the usefulness and perceived ease of use increased after the education, however the behavioral and intention to use the bladder scanner after education either neutralized to neither likely or unlikely or decreased.

LimitationsBarriers

Multiple unanticipated limitations occurred during this project which was beyond the control of this investigator. The main barrier to this project was staff participation. Since engagement in the education and survey was done voluntarily, getting staff to participate was challenging. There were roughly 50-60 staff members (RN, LPN, CNA), and only 31 participated. The administration and staff at the facility were very busy and had a shortage of staff members. Potential participants were less likely to leave their primary duty of caring for their patients to receive the education or engage in pre- and post-questionnaires, impacting the data results. If participants were separated according to their roles in the education and questionnaires, there could have been different perspectives and insights. This could have provided more space for expressing perspectives without fear of repercussions.

A significant limitation was the small sample size; therefore, the survey was neither validated nor any hypothesis testing performed, potentially making the results less reliable. The results cannot be generalized to other LTCFs. Another possible limitation was the timeframe of collecting the pre- and post-data at the facility. In some instances, the staff could meet only at a particular time due to job duties, lack of interest in the education of the bladder scanner, and shift differential. If this were not the case, the percentages received could have had a higher outcome and increased statistical significance. A final limitation in this project was that the maintenance of the bladder scanner was not updated; therefore, the scanner was not always working correctly, thus potentially making the results related to ease of use less accurate.

Improvements

With any project, there is room for improvement. One of the most beneficial improvements would be to extend the timeframe. Considering that the bladder scanner project was implemented in four to eight weeks, a sufficient period of time was not available to assess whether there had been any significant change in behavior regarding its adoption into practice. Moreover, this intervention requires more time consistently allotted to training and education for the staff. Making the education session mandatory would also help improve this intervention, especially since this is being done on a patient, therefore serving as a preventative measure. Despite evidence-based research proving the benefits of bladder ultrasound scanners, nursing homes have slowly adopted this device (Annals of Long-Term Care, 2015), including the specific site of this project.

Discussion

According to the results of the content analysis, bladder scanners are essential for use, but their utilization depends on the intent and behavior of the user. After education, the

percentage of usefulness and perceived ease of use increased; however, behavior and intention to use the bladder scanner either neutralized remained neither likely nor unlikely or decreased.

The desire of nurses to be educated to be updated on current guidelines and infection prevention. Those that participated did glean information which would benefit their patients. This is supported by the research of Mlambo et al., (2021) who determined that continuing professional development (CPD) is vital for nurses who want to keep their skills current in all aspects of patient care. The attitudes and motivations of the nurses as well as their perceptions of barriers, such as organizational culture and administrative support, impact participation. Moreover, the researchers found that the availability of learning opportunities in the workplace environment as well as management's appreciation of the nurse's dedication to CPD were critical to supporting the nurse's participation in educational sessions (Mlambo et al., 2021).

Applying the PDSA model, the *Plan*, to educate the staff of a LTCF on the importance of utilizing a bladder scanner to decrease the incidence of unnecessary catheterizations, therefore reducing UTI instances had a significant change in results after the education. The *Do*, to educate the staff on UTI symptoms among the elderly and using the bladder scanner at their LTCF. The *Study* stage of the PDSA acknowledges the staff's use of the bladder scanner to decrease the number of unnecessary catheterizations to decrease UTI events, thus dropping the facility's overall UTI percentage which had a 63% decrease in UTIs after utilizing the bladder scanner. The *Act* implements bladder scanners among staff to prevent unnecessary catheterizations and UTIs. Using this model helped determine why incorporating a bladder scanner into the nursing staff's routine would benefit the patients. The PDSA model was found to be an effective translational model and was beneficial to the implementation of the project intervention and education.

The results of this project illustrated two things. First, the staff became more confident and knowledgeable on the use of bladder scanner after providing the bladder scanner education. Second, staff education which focused on the most prominent signs and symptoms of urinary retention and UTIs among the elderly, resulted in decreased UTIs among patients. A similar conclusion was found by the work of (Jorge et al., 2017): using US scanners in the patient's clinical evaluation reduces the number of unnecessary urinary catheterization procedures, improving nursing care delivery to patients with urinary retention and lowering the prevalence of catheter-related UTIs.

The cost savings for the project facility was significant. This data was supported by the number of monthly intermittent catheterizations within the facility and the number of monthly UTIs documented after the utilization of the bladder scanner within the months of September and October by the facility infectious control coordinator. In August 2022, the UTI number was 12; however, in September, it dropped to five (58.33% decrease), and in October, the UTI number was four (66.67% decrease). Also, the infectious control had documented that the in/out catheterizations dropped from seven a day to three. Additionally, the facility saved approximately 66.67% cost of supplies in September and October 2022. The facility has the bladder scanner on site and there are plans to add the bladder scanner to the initial urinary retention protocol for their staff to adhere, however unsure when this will happen. A study from the authors of *Annals of Long-term Care* supported the premise. They reported that educating staff on UI and implementing a bladder ultrasound program reduced costs associated with unnecessary catheterizations and the resulting CAUTIs (Annals of Long-Term Care, 2015). During the first year of their investigation, they avoided 1,392 catheterizations. The number of catheterizations avoided was directly related to the integration of the bladder ultrasound scanner,

which resulted in a \$2,784 cost savings in catheter supplies. This study also found a \$45,900 first-year cost savings from avoided UTIs and associated treatment costs (Annals of Long-Term Care, 2015). However, the DNP project findings were not supported by a randomized control trial by Hao and Mahood (2022), for a Canadian health technology review. The trials, conducted in Japan, did not reveal any cost-effective evidence regarding the use of bladder scanner in LTC facilities. They went on to report that they did not find any evidenced based guidelines to support the use of bladder scanners (Qiuki & Mahood, 2022). This may be related to the fact only two studies were done, leaving the confidence of their findings questionable. As with this DNP project, results cannot be generalized to all LTC facilities. Nonetheless, evidenced based guidelines should be considered with additional studies in LTC residents.

Relevance and Recommendations for Clinical Practice

Efforts to improve this project could include revising the facility policy to require bladder scanners before in/out catheterizations, as there is currently no policy. The findings following the staff education illustrate both the benefits and drawbacks of this type of project implementation.

The degree to which urinary incontinence is relevant in long-term care is that it is poorly managed, primarily as a result of the cognitive and physical challenges posed by the LTC population. It is imperative to improve the patient's quality of life and reduce the risk of UTIs among patients within the LTCF. Given these points, staff education should be focused on the signs and symptoms of urinary retention among the elderly, with special significance on the mentally or physically impaired. Using bladder scanners and improved nursing care staff knowledge would improve current practices for managing urinary incontinence in long-term care facilities for frail older adults, despite these deficiencies and comorbidities.

The applicable cost benefits have been clearly outlined, with over 65% decrease in costs during the short project timeline for this facility alone. As discussed, the cost savings could potentially save the facility \$1,718.00 a year if the bladder scanner was utilized as intended. The decrease in expenditures could be funneled into the facility, allowing for improvements in other areas of concern. This would include periodic maintenance of the bladder scanner, as this was not routinely done in the facility.

Further, continuing education on continence care, including bladder scanners or ultrasound machines, is imperative. It is recommended that staff education be a requirement for the practical assessment, management, treatment, and prevention of UTIs in LTC. Training could vary depending on shift and job duties. Suppose this policy is implemented in the future. In that case, the benefits of education will be evident in the staff culture and patient outcomes. If the barriers can be overcome, the advantages of implementing a formal policy could be a game changer for all the stakeholders. Education, procedure, culture, and cost should be prioritized when integrating new technology or evidence-based research into nursing home settings.

Conclusion

According to the CDC, UTIs result in approximately 20-30% of illnesses reported by long-term care facilities; this includes 5,000,000 aged 65 and older who were among those visiting the emergency room with a diagnosis of UTI and needing treatment (CDC, 2018). The bladder scanner is non-invasive and causes no harm to the patient. In contrast, unnecessary and multiple catheterizations may introduce bacteria, resulting in an upper urinary tract infection. The bladder scanner would benefit if implemented within the facility due to the statistical findings and decreased patient UTIs after the staff education. Per the nursing staff, the current policy does not mention using bladder scanners, only intermittent catheterization if the patient

goes beyond the timeframe of urinating. The bladder scanner's importance and ease of use have shown an increase of 35% after implementation in the project facility; therefore, applying the bladder scanner into practice is unequivocally essential for the staff and the patient, its impact on the income of the facility, and the decrease in hospitalizations for the patients. The benefits of this technology extend beyond the practice to the patient as well.

Sustainability includes continuing awareness of urinary incontinence among the elderly and is the first step in decreasing UTIs. Although the anticipated results were less than optimal, the data brought forward evidence that the education and the utilization of the bladder scanner reduced the overall UTIs within the facility and unnecessary in/out catheterizations. In order to sustain the project's education, the plan will be to leave behind a laminated start-to-finish direction sheet connected to the bladder scanner and an individual educational sheet printed out for each staff member utilizing the bladder scanner to help with the ease of use. This was done due to the staff's expectation that the bladder scanner would be difficult to use, which was out of proportion to its actual structural function.

In conclusion, it is imperative to improve the patient's quality of life and reduce the risk of UTIs among patients within the LTCF. Improvement strategies should be embedded into the culture and norms of the facility. A high level of care can only be achieved through evidence-based clinical practices and proactive and preventative strategies. The use of bladder scanners supports the commitment to improving the safety of the residents of LTC facilities.

References

Agency for Healthcare Research and Quality. (2017, March). Guide to implementing a program to reduce catheter-associated urinary tract infections in long-term care. Agency for

- healthcare research and quality. <https://www.ahrq.gov/hai/quality/tools/cautitc/modules/implementation/guide.html>
- Agudo-Peregrina, Á. F., Hernández-García, Á., and Pascual-Miguel, F. J. (2014). Behavioral intention, use behavior and the acceptance of electronic learning systems: differences between higher education and lifelong learning. *Comput. Human Behav.* 34, 301–314. doi: 10.1016/j.chb.2013.10.035
- Ajayi, T., & Radhakrishnan, R. (2016). Urinary tract infection in older adults in long-term care facilities. *Canadian Medical Association Journal*, 188(12), 899–899. <https://doi.org/10.1503/cmaj.150708>
- Annals of Long-Term Care. (2015, June). Implementation science in nursing homes: A case study of the integration of bladder ultrasound scanners. HMP global learning network. <https://www.hmpgloballearningnetwork.com/site/altc/articles/implementation-science-nursing-homes-case-study-integration-bladder-ultrasound-scanners>
- Bladder scanning: The benefits. (2020, December 20). Cardiac Direct. <https://www.cardiacdirect.com/bladder-scanning-the-benefits/>
- Brusch, J. L., & Bronze, M. S. (2021, April 1). Catheter-related urinary tract infection (UTI). Medscape.
- CDC. (2017). Urinary tract infection (UTI) event for long-term care facilities [PDF]. https://www.cdc.gov/nhsn/PDFs/LTC/LTCF-UTI-protocol_FINAL_8-24-2012.pdf
- CDC. (2018). Urinary tract infection. Centers for Disease Control and Prevention. <https://www.cdc.gov/nhsn/PDFs/LTC/LTCF-UTI-protocol-current.pdf>
- Christianson, T. M., Hoot, T. J., & Todd, M. (2021). Understanding nursing knowledge of continence care and bladder scanner use in long-term care: An evaluation study.

Gerontology and Geriatric Medicine, 7, 233372142110460.

<https://doi.org/10.1177/23337214211046090>

Chu, C. M., & Lowder, J. L. (2018). Diagnosis and treatment of urinary tract infections across age groups. *American Journal of Obstetrics and Gynecology*, 219(1), 40–51.

<https://doi.org/10.1016/j.ajog.2017.12.231>

Complications of UTI in the elderly: What you need to know. (2021, August 25). Centric Healthcare. <https://www.centrichealthcare.org/complications-of-uti>

Cortes-Penfield, N. W., Trautner, B. W., & Jump, R. L. (2017). Urinary tract infection and asymptomatic bacteriuria in older adults. *Infectious Disease Clinics of North America*, 31(4), 673–688. <https://doi.org/10.1016/j.idc.2017.07.002>

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319. <https://doi.org/10.2307/249008>

Hamilton, F. (2018). Catheter associated urinary tract infection, a different perspective with a focus on long term urinary catheterization. *Infection, Disease & Health*, 23, S15.

<https://doi.org/10.1016/j.idh.2018.09.060>

Hao, Q., & Mahood, Q. (2022). *View of bladder scanners in personal care homes*. CADTH health technology review.

<https://canjhealthtechnol.ca/index.php/cjht/article/view/RC1470/1211>

Jiang, M., Jong, M., Lau, W., Meng, Y., Chai, C., & Chen, M. (2021). Validating the general extended technology acceptance model for e-learning: Evidence from an online english as a foreign language course amid covid-19. *Frontiers in Psychology*, 12.

<https://doi.org/10.3389/fpsyg.2021.671615>

- Jorge, B., Mazzo, A., Martins, J., Henriques, F., & Cassini, M. (2017). The person with urinary retention: Student perception and scientific evidence on the use of portable ultrasound scanners. *Reference Nursing Journal, IV Series* (12), 19–26.
<https://doi.org/10.12707/riv16078>
- Komagamine, J., Yabuki, T., Noritomi, D., & Okabe, T. (2022). Prevalence of and factors associated with atypical presentation in bacteremic urinary tract infection. *Scientific Reports, 12*(1). <https://doi.org/10.1038/s41598-022-09222-9>
- McDaniel, C., Ratnani, I., Fatima, S., Abid, M., & Surani, S. (2020). Urinary incontinence in older adults takes collaborative nursing efforts to improve. *Cureus*.
<https://doi.org/10.7759/cureus.9161>
- Meddings, J., Saint, S., Krein, S. L., Gaies, E., Reichert, H., Hickner, A., McNamara, S., Mann, J. D., & Mody, L. (2017). Systematic review of interventions to reduce urinary tract infection in nursing home residents. *Journal of Hospital Medicine, 12*(5), 356–368.
<https://doi.org/10.12788/jhm.2724>
- Medicare.gov. (2021). [https://www.medicare.gov/care-compare/details/nursing-home/345209?id=2f03d46b-bd40-47e7-a122-54470d18bd97&city=Winston Salem](https://www.medicare.gov/care-compare/details/nursing-home/345209?id=2f03d46b-bd40-47e7-a122-54470d18bd97&city=Winston%20Salem)
- Mlambo, M., Silén, C., & McGrath, C. (2021). Lifelong learning and nurses' continuing professional development, a metasynthesis of the literature. *BMC Nursing, 20*(1).
<https://doi.org/10.1186/s12912-021-00579-2>
- Nicolle, L. E. (2014). Urinary tract infection in long-term care facilities. *Healthcare infection, 19*(1), 4–12. <https://doi.org/10.1071/hi13043>
- Ostaszkiwicz, J., Tomlinson, E., & Hunter, K. (2020). The effects of education about urinary incontinence on nurses' and nursing assistants' knowledge, attitudes, continence care

- practices, and patient outcomes. *Journal of Wound, Ostomy & Continence Nursing*, 47(4), 365–380. <https://doi.org/10.1097/won.0000000000000651>
- Palese, A., Buchini, S., Deroma, L., & Barbone, F. (2010). The effectiveness of the ultrasound bladder scanner in reducing urinary tract infections: A meta-analysis. *Journal of Clinical Nursing*, 19(21-22), 2970–2979. <https://doi.org/10.1111/j.1365-2702.2010.03281.x>
- Plan-do-study-act (PDSA). (2022). Institute for healthcare improvement. <http://www.ihl.org/resources/Pages/Tools/PlanDoStudyActWorksheet.aspx>
- Price, S., & Reichert, C. (2017). The importance of continuing professional development to career satisfaction and patient care: Meeting the needs of novice to mid- to late-career nurses throughout their career span. *Administrative Sciences*, 7(2), 17. <https://doi.org/10.3390/admsci7020017>
- Prieto, J. (2016, March). Optimizing the use of bladder ultrasound scanners to improve the quality and safety of patient care and reduce cost. <https://www.rcn.org.uk/professional-development/research-and-innovation/~/-/-/media/b688bec388d14c25b5378a8f28dc44a5.ashx>
- Schallom, M., Prentice, D., Sona, C., Vyders, K., Arroyo, C., Wessman, B., & Ablordeppey, E. (2020). Accuracy of measuring bladder volumes with ultrasound and bladder scanning. *American Journal of Critical Care*, 29(6), 458–467. <https://doi.org/10.4037/ajcc2020741>
- Taylor, M. J., McNicholas, C., Nicolay, C., Darzi, A., Bell, D., & Reed, J. E. (2013). Systematic review of the application of the plan–do–study–act method to improve quality in healthcare. *BMJ Quality & Safety*, 23(4), 290–298. <https://doi.org/10.1136/bmjqs-2013-001862>

Urinary tract infection. (2021). National Center of Biotechnology Information.

<https://www.ncbi.nlm.nih.gov/books/NBK470195/>

Viner, S., & Gautam, R. (2020). Urinary tract infection knowledge of long-term care nursing staff: The effect of an educational intervention. *Urologic Nursing*, 40(1), 7.

<https://doi.org/10.7257/1053-816x.40.1.7>

Widdall, D. A. (2015). Considerations for determining a bladder scan protocol. *Journal of the Australasian Rehabilitation Nurses' Association*, 18(3), 22–27.

<https://doi.org/10.33235/jarna.23.2.2-3>

Wooller, K. R., Backman, C., Gupta, S., Jennings, A., Hasimja-Saraqini, D., & Forster, A. J. (2018). A pre and post intervention study to reduce unnecessary urinary catheter use on general internal medicine wards of a large academic health science center. *BMC Health Services Research*, 18(1). <https://doi.org/10.1186/s12913-018-3421-2>

Appendices

Appendix A

Approved site consent for educational materials for staff:

Melissa,

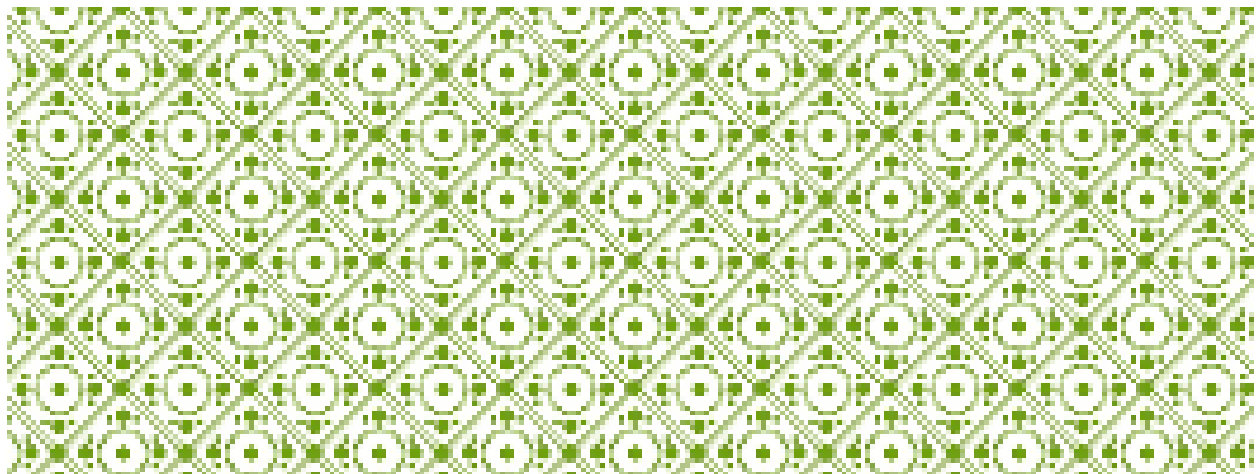
Thank you for your proposal for your project here at LHCC. It is fine to do this here at _____, dba Lexington Operator LLC.

If you have any additional questions, do not hesitate to contact me.

Heather McGroarty, LNHA
LHCC

Appendix B

PowerPoint educational materials



URINARY RETENTION AND UTI SYMPTOMS AMONG THE ELDERLY

By: Melissa O'Bryant, BSN, RN,
DNP student ☺

SIGNS AND SYMPTOMS OF A PATIENT HOLDING ONTO URINE (URINARY RETENTION)

- Inability to empty the bladder when urinating
- Urinating very small amounts at a time
- Improper or lack of cleaning foley/peri care
- Difficulty starting stream
- Slow urine stream
- Feeling the need to urinate after finishing urinating
- Urgent need to urinate, but with little success
- Swelling or distention in the lower abdomen
- Lower abdominal pain

Urinary retention can be caused by a blockage or by the bladder failing to maintain a strong enough force to expel all of the urine.

Inefficient bladder contraction occurs when the bladder muscles do not contract long enough to empty the bladder.

Some neurological problems can lead to this, such as **Parkinson's, MS, Alzheimer's, stroke, DM, Brain injury, and Gillian Barre syndrome.**

Medications: Antipsychotics, CCB, Antidepressants, antiparkinsonians, NSAIDS, opioids, etc.

SIGNS OF UTI AMONG ELDERLY

- *frequent falls
- *Confusion/disorientation *****
- *Dizziness
- *Agitation or aggression
- *Fatigue and lethargy
- *decreased appetite
- *fever
- * Burning during urination
- *Pain in lower abdomen
- *Fatigue
- *sudden changes in urination patterns

What happens if UTI goes untreated and why is this important?

-Can cause spread of infection from the bladder to kidneys and beyond, leading to sepsis and hospitalization.

How can we prevent UTI's?

- encourage fluids
- practice good urinary hygiene
- washing hands

-(and why I am here....use the bladder scanner to prevent in/out catheterizations that are unnecessary; therefore preventing UTIs)

BLADDER SCANNER

The WHY?

-the prevention of unnecessary in/out catheterizations (on average, 280 are done a month -7 per day)

-reduce UTIs among residents (one of the most common causes of UTIs is catheter use) anywhere from 2-12 occur each month.

-shows urine withheld in the bladder

-it is a safe, painless, and reliable procedure

-very quick to use

-reduce the number of pts sent to ED for UTIs

-save the cost of equipment used for in/out caths (1.55\$ each for some cost of supplies)

The HOW?

-Gather all of your equipment (Scanner, KY jelly, and a small hand towel or cloth) and your patient, of course.

-you want to have your patient lying supine if you can for best results (this is the same for male/female)

-I have a start-to-end directions sheet for you. We will practice now!!

REFERENCES:

SYMPTOMS & CAUSES OF URINARY RETENTION. (2019). NATIONAL INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES. [HTTPS://WWW.NIDDK.NIH.GOV/HEALTH-INFORMATION/UROLOGIC-DISEASES/URINARY-RETENTION/SYMTOMS-CAUSES](https://www.niddk.nih.gov/health-information/urologic-diseases/urinary-retention/symptoms-causes)

DAVIS, F. D. (1989). PERCEIVED USEFULNESS, PERCEIVED EASE OF USE, AND USER ACCEPTANCE OF INFORMATION TECHNOLOGY. *MIS QUARTERLY*, 13(3), 319. [HTTPS://DOI.ORG/10.2307/249008](https://doi.org/10.2307/249008)

PALESE, A., BUCHINI, S., DEROMA, L., & BARBONE, F. (2010). THE EFFECTIVENESS OF THE ULTRASOUND BLADDER SCANNER IN REDUCING URINARY TRACT INFECTIONS: A META-ANALYSIS. *JOURNAL OF CLINICAL NURSING*, 19(21-22), 2970-2979. [HTTPS://DOI.ORG/10.1111/J.1365-2702.2010.03281.X](https://doi.org/10.1111/j.1365-2702.2010.03281.x)

Appendix C

Quick Reference Guide-laminated and placed on the Rosie Bladder Scanner at the facility.

1. Power On
2. Select Scanning Mode – Select - Male, Female or Pediatric <60 lbs
3. With Resident Supine – Apply gel (with no air bubbles) to midline approximately 1 inch (2-3 cm) above the pubic symphysis
4. Orient the probe per the pictures on the probe head. (feet and head)
5. Aim towards the Bladder – a gentle tilt towards the coccyx.
6. Press the scan button once to ensure the red line is centered in the bladder. If not reposition.
7. Press scan again and print if necessary.
8. Results will be displayed in ml

Reference:

<https://nurserosie.com/wp-content/uploads/2019/05/RosieScan-Manual.pdf>

Appendix D**Volunteer Feedback Survey****Pre/Post questionnaire on the use of bladder scanners****1. Behavioral intention to use bladder scanner?**

- Very likely
- Likely
- Neither likely nor unlikely
- Unlikely
- Very unlikely

2. Perceived usefulness of bladder scanner

- Very easy
- Easy
- Neither easy nor difficult
- Difficult
- Very difficult

3. Perceived ease of use

- Very easy
- Easy
- Neither easy nor difficult
- Difficult
- Very difficult

4. Intention to use bladder scanner?

- Very likely
- Likely
- Neither likely nor unlikely
- Unlikely
- Very unlikely

Appendix E

PDSA model approval

Thank you for your interest in the PDSA cycle. I am happy to grant nonexclusive permission to reprint the cycle in your forthcoming paper for the University of Greensboro, NC. Please indicate that the PDSA cycle is reprinted from W. Edwards Deming, *The New Economics for Industry, Government, Education, third edition*, figure 13, page 91, reprinted courtesy of The MIT Press.

With best wishes,

Pamela

Pamela Quick
Subsidiary Rights Manager
The MIT Press
One Broadway, Floor 12
Cambridge, MA 02142, USA
1-617-253-0080