Silver Alloy-Coated Urinary Catheters: Preventing Urinary Tract Infection

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Abstract

Background: A urinary tract infection (UTI) involves any part of the urinary system, including the urethra, ureter, kidney, and bladder. Urinary tract infections are the most common healthcare-associated infection reported to National Healthcare Safety Network (NHSN). A UTI is also the second most frequent infection in long-term care (LTAC) facilities, making it the most common cause of bacterial infection or sepsis and hospitalization. Patients with urinary catheters are at an increased risk of infection, and standard catheters reduce the body's natural ability to cleanse the urinary tract of microorganisms. Bacteria can colonize into biofilms that attach themselves to the catheter surface and may cause catheter blockage and, as a result, develop a resistance to antibiotics. Silver alloy-coated catheters can reduce biofilm formation and colonization by releasing silver ions in the urinary tract.

Setting and Subjects: A long-term care facility for elderly patients ages 55 to 99 years of age with frequent urinary tract infections due to chronic catheter use.

Aim: To determine the effect of silver alloy-coated urinary catheters in preventing urinary tract infection compared with standard silicone or latex urinary catheters in patients with chronic use.

Method: This quality improvement project used Kurt Lewin's change model with the PDSA method. The intervention involved the replacement of current standard urinary catheters with silver-alloy coated urinary catheters for 5 weeks in a long-term care facility.

Result: A total of seven patients were initially enrolled in the quality improvement (QI) project. Two dropped out due to worsening health-related issues. Forty percent had negative urinalysis, another 40% were asymptomatic with multidrug-resistant bacteria, and 20% had no negative urinalysis.

Conclusion: Using a silver alloy-coated urinary catheter reduced symptomatic catheter-associated urinary tract infection (CAUTI) occurrences as defined by clinical criteria.

Keywords: Catheter-associated urinary tract infection, asymptomatic bacteriuria, silver alloy catheters, noble catheter, Foley catheter, urinary tract infection

Introduction

Urinary tract infection (UTI) is among the most frequent healthcare-associated infections globally. It is associated with increased mortality, prolonged hospitalization, and increased healthcare costs. The main aim of this Quality Improvement Project is to evaluate the efficacy of the silver alloy-coated catheter in preventing the incidence of catheter-associated urinary tract infection (CAUTI) in patients with chronic catheter use. CAUTI is often caused by multi-drug resistant strains that are globally detrimental to human health.

According to the U.S. Centers for Disease Control and Prevention (CDC, 2022), CAUTI is defined by positive urine culture (bacteriuria) and at least one of the following symptoms: dysuria, fever, urinary urge or frequency, and costovertebral tenderness. It occurs in 3-6 % of the time in catheterized patients

Magnusson et al. (2019) conducted a retrospective-prospective clinical case study to investigate a case of a permanently (suprapubic) catheterized woman with neurogenic bladder dysfunction due to frequent catheter-associated urinary tract infection. In 2013, the patient's catheter was substituted for the silver alloy-coated urinary catheter coated with a noble metal alloy (NMA) of gold, silver, and palladium. The result showed that long-term use of an NMA-coated catheter was associated with cessation of frequent CAUTIs in this patient, and no acute adverse effects about the noble catheter were noted.

Likewise, according to Banaszak et al. (2020), The Infectious Disease Society of America (IDSA) noted that acceptable guidelines for catheter use are substantial and

symptomatic urinary retention in the face of ineffective medical therapy, urinary incontinence for terminally ill patients, and correct monitoring of fluid status in critically ill patients. Also, indwelling catheterization of the urinary bladder in SCI patients is an independent risk factor for UTI development, with an estimated 50% of catheters placed inappropriately and kept longer than necessary. Given that the highest incidence of catheter-associated urinary tract infection (CAUTI) occurs in SCI patients, there is a need for regular patient reassessment and discontinuation of the Foley catheter as soon as possible in this high-risk population.

This quality improvement project evaluated the effectiveness of silver alloy-coated urinary catheters in preventing recurrent urinary tract infection in chronic catheter use like patients with neurogenic dysfunction, compared with current standard indwelling catheters in a long-term care setting. A 10-day reflective practice was done in a long-term care facility to find the incidence of the frequency of CAUTI and the need for practice change.

Problem Description

Catheter-associated urinary tract infections (CAUTIs) are a common occurrence associated with increased patient morbidity and mortality. Any intervention resulting in a decrease in the incidence of CAUTIs would have a significant impact on patient quality of life and costs. Urinary tract infection is a severe complication in patients with chronic bladder disfunction. Furthermore, Davenport & Keeley (2005) asserts that despite improved treatment methods, urinary tract morbidity still ranks as the second leading cause of death in SCI patient. Bladder catheterization is the most crucial factor predisposing patients with neurogenic bladders to UTIs. By reviewing the

current literature, the use of silver-alloy-coated hydrogel catheters can reduce CAUTIs by 45% (Davenport & Keeley, 2005).

To identify the practice problem, patients 55 to 99 years old, both female and male, with chronic catheter use due to bladder dysfunction, such as neurogenic bladder post-spinal cord injuries, strokes, and multiple sclerosis, were followed for 10 days of reflective practice. Seven patients were shown that met the criteria for silver alloy-coated urinary catheter due to recurrent urinary tract infection and asymptomatic bacteriuria due to bacteria colonization that needed antibiotic therapy with a positive culture. These patients usually do not require antibiotic treatment because of not meeting the criteria for treatment but must be treated due to liability purposes despite education on antibiotic stewardship. Other diagnoses met during the reflective practice review were pneumonia, hip and knee surgeries, and osteomyelitis due to a diabetic wound. Another scenario is the non-UTI syndromes, whereby patients present with nonspecific symptoms like confusion and lethargy. A urine dipstick will show positive nitrite and leukocyte esterase and a colony count of 25-100 thousand with an identified organism. This leads providers to prescribe antibiotics. Hence, the risk of inappropriate antibiotic use in the scenarios above, i.e., asymptomatic bacteria and non-UTI syndrome. This will in turn promote the emergence of multidrug-resistant organisms (MDRO) and the increased risk of clostridium difficle infection adverse effects from antibiotic medications. Ideas were generated via a search of literature review to assess available knowledge and relevant studies showing the effectiveness of the use of these noble alloy catheters in preventing frequent urinary tract infections, and given these findings, the quality improvement study question was framed as follows:

P: In elderly patients ages 55-99, with chronic catheter use and recurrent urinary tract infections (UTI)

I: Silver alloy-coated urinary catheter

C: Regular indwelling urinary catheter

O: Prevention of frequent urinary tract infection

T: 5 weeks

Project Framework

Kurt Lewin's change model can help bridge the gap between the old therapies (antibiotics, increase risk catheters) in the treatment of frequent UTIs inherent in chronic catheterization and alloy catheter use. Kurt Lewin’s change theory involves unfreezing, change, and refreezing stages. This form of change model emphasizes that the process of change entails creating the belief that a change is needed and moving forward to the new desired level, and finally solidifying the new behavior and keeping it as the norm. *(*Cummings et al., Bridgman, 2016). This model was adopted to search for evidence-based literature on background problems, interventions, and outcomes that support the use of silver-coated urinary catheters in preventing CAUTIs. This model also supplies a proper framework to organize and translate the evidence gathered into clinical practice.

Figure 1

Kurt Lewin’s Change Model (Cummings et al., 2016)

Present practice that needs change New Intervention Keep new intervention

Translation Method

This quality improvement project focused on preventing urinary tract infections in patients with bladder dysfunction with frequent urinary tract infections due to chronic use of Foley catheters. Fifty-one patients were seen and during reflective practice to find background problems, using Kurt Lewin's change model theory seen above in Figure 1. A literature review was conducted to find available knowledge and information about silver alloy-coated urinary catheters in UTI prevention. Knowledge of use was gained via database search only; I had not used these catheters or seen them in practice. Published articles were found using PubMed, Google Scholar, and catheter manufacturers. The investigation helped show practice gaps and confidence that the intervention will improve patients' outcomes and reduce overall costs. This quality improvement was conducted initially with seven patients; two patients dropped out due to extraneous issues, and five patients eventually completed it. Patients that took part in QI consent after the education on catheters.

Results

Of the five patients that completed the quality improvement intervention with silver alloy-coated urinary catheters. Two patients' urinary studies were negative, with no positive leukocyte esterase, nitrites, or white blood cells in urine. The other two patients had asymptomatic bacteriuria, colonized bacteria, and multidrug-resistant organisms. The last patient was symptomatic, another MDRO but positive for yeast. The last patient was treated with antifungal only

Available Knowledge

Search Strategies

An electronic literature search of PubMed, Google Scholar, Cochrane, SCOPUS, Embase, and CINAHL were utilized using keywords such as a silver alloy-coated catheter, asymptomatic bacteriuria, and catheter-related urinary tract infection (CAUTI), noble catheter, and Foley catheter. Other studies that were prospective, randomized controlled trials related to the use of the silver alloy catheter in urinary tract infection prevention were also included in the search that yielded 75 articles. The reliability, validity, implications to practice, strengths, and weaknesses were examined; all had to meet the standard for the quality improvement project.

Literature Review

According to the CDC (2022), CAUTI is defined by a positive urine culture (bacteriuria) and at least one symptom. Urinary tract infections (UTIs) are the fifth most common type of healthcare-associated infection, with an estimated 62,700 UTIs in acute care hospitals in 2015. UTIs additionally account for more than 9.5% of infections reported by acute care hospitals. Virtually all healthcare associated UTIs are caused by instrumentation of the urinary tract. (CDC, 2022).

Approximately 12% to 16% of adult hospital inpatients will have an indwelling urinary catheter (IUC) during their hospitalization. Each day the indwelling urinary catheter remains, a patient has a 3% to 7% increased risk of getting a catheter-associated urinary tract infection (CAUTI). CAUTI can lead to prostatitis, epididymitis, orchitis in males, cystitis, pyelonephritis, gram-negative bacteremia, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis in patients. Complications associated with CAUTI cause discomfort to the patient and result in a prolonged hospital stay and increased cost and mortality. It has been estimated that each year, more than 13,000 deaths are associated with UTIs (CDC, 2022).

According to Sun et al. (2020), urinary tract infections (UTIs) are among the most common nosocomial diseases, with indwelling catheters contributing to an estimated 80% of these disorders. Catheter-associated UTIs (CAUTIs) can lead to significant morbidity with prolonged hospital stays and escalation in treatment costs in both high-income and low-income countries. However, nursing personnel are increasingly involved in preventing hospital-acquired infections and are engaged in daily catheter care and selecting right catheters to reduce the incidence of CAUTIs. While healthcare providers often employ standard uncoated catheters, several anti-microbial and anti-

septic coated catheters are available, reducing the risk of CAUTIs. These catheters are coated with silver alloy, noble metal alloy, chlorhexidine, and nitrofurazone to minimize the risk of CAUTIs.

A multicenter randomized, multi-center, prospective clinical study by Kai-Larsen et al. (2021) showed a significant reduction of CAUTI in patients receiving the NMA-coated BIP Foley catheter versus an uncoated control catheter. A 60% reduction in bacteriuria translated to a 70% reduction in CAUTI incidence over the whole study period. The cumulative incidence of CAUTI was significantly lower in the BIP Foley catheter group between the period three to 30, showing that the device is effective in both short- and medium-term use. Importantly, this study did not reveal any BIP Foley catheter safety concerns.

Another study conducted by Chung et al. (2017) reviewed an intervention of a noble metal coated urinary catheter compared with a standard catheter not coated with noble metal or any antimicrobial. Thidefinition of the National Healthcare Safety Networ

Rupp et al. (2004) conducted a -year of prospective surveillance study in ten 10 patient care units to find the rate of catheter-associated UTIs. The method used was the historic control, used to assess the effect of the coated catheter. A cost-effectiveness analysis was also conducted using a range of cost estimates. Silver susceptibility was found for microbes responsible for catheter associated UTIs. The study concluded that

silver alloy, a hydrogel-coated urinary catheter, was associated with a significant decline in nosocomial UTI and cost savings over cost estimates.

A randomized controlled trial study done by Bonfill et al. (2013) noted the prevalence of CAUTI in nonacute spinal cord patients who carry indwelling catheters and increased risks in this population. A comparison was made between standard urinary catheters and antiseptic silver alloy catheters and found that the latter intervention proved promising for urinary tract infection (UTI). The trial was a 14-center randomized trial of 489 patients undergoing spine surgery, with 73% of patients suffering a traumatic SCI. There was no difference in the median time of catheterization (27 vs. 28 days; $p = 0.202$). There was no statistical difference in the rate of CA-UTI in the experimental 18 patients (18/489 patients; 7.41%) and the control group (19/489; 7.72%) (OR = 0.96). This group also reported an increased rate of adverse events in the silver alloy-coated catheter. However, the study emphasized that data could not be extrapolated to spinal cord injury patients.

Benaszek et al. (2020) conducted another study that examined the use of silver-coated silicone urinary catheters in patients with acute traumatic cervical SCI to prevent catheter-associated urinary tract infection. Spinal cord injury (SCI) remains one of the most devastating conditions affecting trauma patients. This study emphasizes that urinary tract infections are among the most common complications following traumatic SCI, including pneumonia, neuropathic pain, decubitus ulcers, and delirium. The Infectious Disease Society of America (IDSA) notes that acceptable guidelines for catheter use are substantial and symptomatic urinary retention in ineffective medical therapy, urinary incontinence for terminally ill patients, and correct monitoring of fluid

status in critically ill patients and during a lengthy surgical procedure. however, indwelling catheterization of the urinary bladder in SCI patients is an independent risk factor for UTIs development. Urinary catheters in acute traumatic SCI are initially used for fluid balance monitoring and prevention of retention in the immediate postoperative period.. However, an estimated 50% of catheters are placed inappropriately and kept longer than necessary. The study concluded the efficacy of silver alloy urinary catheters in decreasing the incidence of CAUTI as well as alterations in the microbiological profile, hence decreasing antimicrobial sensitivity. Overall, there was a practice due to the beneficial impact of this study in patients with ATSCI, and a cost-benefit analysis was performed that showed significant cost savings of noble catheter use and, in the long run, compared to standard urinary catheters.

Lederer et al. (2014) noted a 47% relative reduction in CAUTI incidence for silver-alloy hydrogel catheters compared to standard latex catheters. This group reported 0.945/1000 patient days vs. 0.498/1000 patients' days in both groups (and = 0.53; $p < 0.0001$).

In a multicenter study of CA-UTI rate in ICU patients, Bologna et al., (1999) noted improved adjusted and unadjusted infection rates for hydrogel/silver-coated catheters compared to standard latex catheters. The study showed a trend toward a reduction in NUTIs with the use of the hydrogel/silver-coated catheter was noted in all intensive care units at each institution as shown by the unadjusted and adjusted catheter-associated infection rates. One hospital demonstrated a statistically significant reduction in NUTIs. However, statistical significance was not met when the results were adjusted. The cost analysis at one institution demonstrated cost savings with the use of

the silver-coated catheter. Future analysis may require a double-blind, prospective-controlled study of longer duration to reach statistical significance.

In a *meta*-analysis of randomized controlled trials by Saint, et al. (1998), silver alloy-coated catheters reduced the risk of asymptomatic bacteriuria compared to standard latex catheters (control latex catheters were either uncoated or coated with hydrogel, Teflon, or silicone). In contrast, there were no differences compared to standard silicone catheters.

Another meta-analysis study complied by Saint et al. (2000) assessed the clinical and economic impact of using silver alloy-coated urinary catheters in hospitalized patients with silver alloy catheters and standard (noncoated) urinary catheters. The study concluded with the base-case analysis that the use of silver-coated catheters led to a 47% relative decrease in the incidence of symptomatic UTI from 30 to 16 cases per 1000 patients (number needed to treat = 74) and a 44% relative decrease in the incidence of bacteremia from 4.5 to 2.5 cases per 1000 patients (number needed to treat = 500) compared with standard catheters. The use of silver alloy catheters resulted in estimated cost savings of $4.09 per patient compared with standard catheter use ($20.87 vs. $16.78). In a multivariate sensitivity analysis using Monte Carlo simulation, silver-coated catheters supplied clinical benefits over standard catheters in all cases and cost savings in 84% of cases. Outcomes included the incidence of symptomatic UTI and bacteremia and direct medical costs.

Karchmer et al. (2000) conducted a 12-month randomized crossover trial that compared rates of nosocomial catheter-associated UTI in patients with silver-coated

and uncoated catheters. A cost analysis showed that the risk of infection declined by 21% among study wards randomized to silver-coated catheters and by 32% among patients in whom silver-coated catheters were used on the controls. The more expensive silver-coated catheter appeared to save costs by preventing excess hospital costs from nosocomial UTI associated with catheter use.

Magnusson et al. (2021) conducted a retrospective-prospective clinical case study to investigate a case of a permanently (suprapubic) catheterized woman with neurogenic bladder dysfunction. The patient had suffered from recurrent catheter-associated urinary tract infections (CAUTIs) since 2009, despite several prevention approaches and attempts, such as antibiotic treatments of CAUTI that s gradually declining as a result rapid development of resistant strains. In 2013, the patient's catheter was substituted for the BIP Foley Catheter, coated with a noble metal alloy (NMA) of gold, silver, and palladium. Results showed that long-term use of an NMA-coated catheter was associated with the cessation of frequent CAUTIs. The catheter experience was reported as comfortable, and inflammatory markers were reduced with time. The coating was stable, with no significant metal release into the urine, and safe for the patient. The levels of the noble metal’s gold, silver, and palladium remaining on the BIP Foley catheter after use were the same as for unused catheters. A catheter-associated urinary tract infection (CAUTI) is almost always preceded by bacteriuria, developing 3% to 6% per day in catheterized patients. Bacteriuria can be asymptomatic and may persist as such for extended periods (Magnusson et al., 2021). However, in many cases, bacteriuria eventually results in local or systemic symptoms, such as urgency, dysuria, abdominal pain, and fever, and microbes from the urinary tract can

spread and cause sepsis, septic shock, and multi-organ failure, as reported for 2%, 0.3%, and 1.7% of cases, respectively, got UTIs. As the risk of infection increases with the duration of catheterization, CAUTI is a significant health burden for patients with neurogenic bladder dysfunction who use indwelling catheters chronically. These patients suffer from potentially life-threatening voiding dysfunction owing to a brain, spinal cord, or other nerve condition caused by, for example, stroke, spinal cord injury (SCI), multiple sclerosis, or congenital disabilities. CAUTI remains one of the most prevalent morbidities for these patients, leading to hospitalization with reduced quality of life.

Comparing these findings to the current quality improvement project, there are similarities with the development of background problems using the PICOT question, silver alloy-coated catheters in urinary tract infection prevention, cohort involved, outcome, and implication to practice. Some studies emphasized no differences in using both catheters in CAUTI prevention, recommending further studies for clarity. In other words, the primary outcome of using silver alloy-coated urinary in decreasing the incidence of CAUTI was achieved.

Specific Aim

This quality improvement aimed to find the efficacy of silver-coated silicone urinary catheters in preventing CAUTI-associated urinary tract infections in patients with chronic Foley catheter use with bladder dysfunction. The evaluation processes and outcomes were evaluated with the QI Model Plan-Do-Study-Act (PDSA) cycle.

Methods and Design

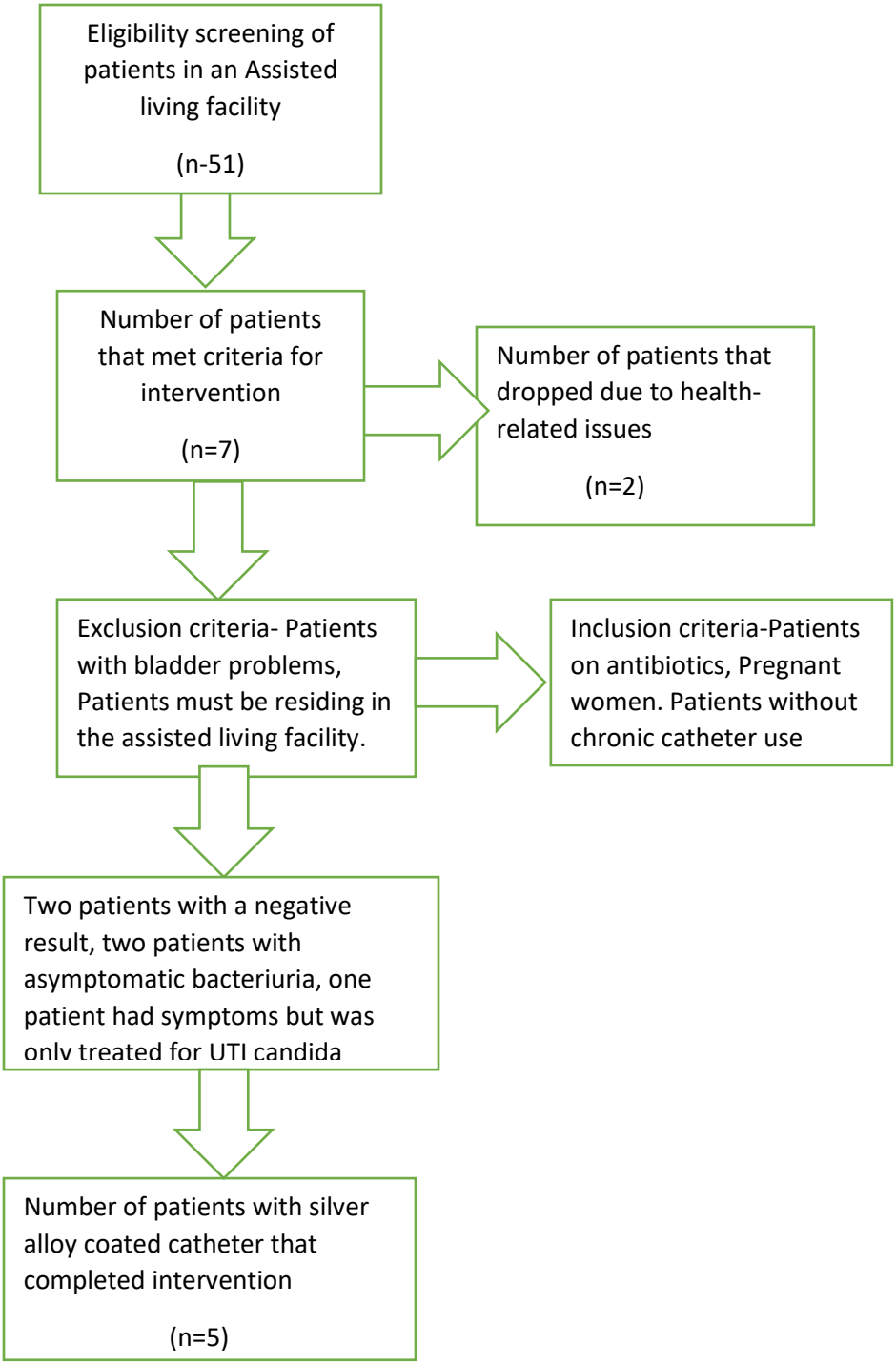
This quality improvement was conducted in a long-term care facility at The Regal Estates assisted living for 5 weeks from February 10, 2022, to March 17, 2022. There were seven patients initially, but two were excluded due to health problems. The patients, ages 55-99, that agreed with the intervention received the silver alloy-coated urinary catheters. Patients without chronic catheters, antibiotic therapy, hospice, and outpatient were excluded from the project. The COVID-19 pandemic had an early impact on the start date because three patients in the QI project were briefly hospitalized with COVID-19 pneumonia. Ethical approval was obtained from the University of Texas at El Paso Institutional Review Board (IRB), which ensures almost compliance with human subjects. The Regal Estates Assisted Living Facility issued a letter of support for QI project implementation. Verbal consents were gathered from patients/POAs that agreed to take part in the project.

The criteria for inclusion in this quality improvement project are patients, 55 to 99 years of age, male and female, with or without traumatic or medical spinal cord injury. Another inclusion criteria are for patients that will need an indwelling urinary catheter as a method of bladder drainage for at least 5 weeks. Patients who are willing to take part in the intervention gave their written informed consent (If a patient is unable to give written consent because of physical or mental disability, an affirmation of consent was taken in their presence from their relative or legal guardian). The following patients were not included in the QI project: Patients who can receive help from another method of bladder drainages such as intermittent catheterization, or reflex voiding; as well as those using an external collector. Patients with urinary tract infection on

antibiotics use or use within 7 days prior to inclusion and patients with Known allergy to latex, silver salts, or hydrogels. Pregnant or breastfeeding woman.

Figure 2

Flow Diagram



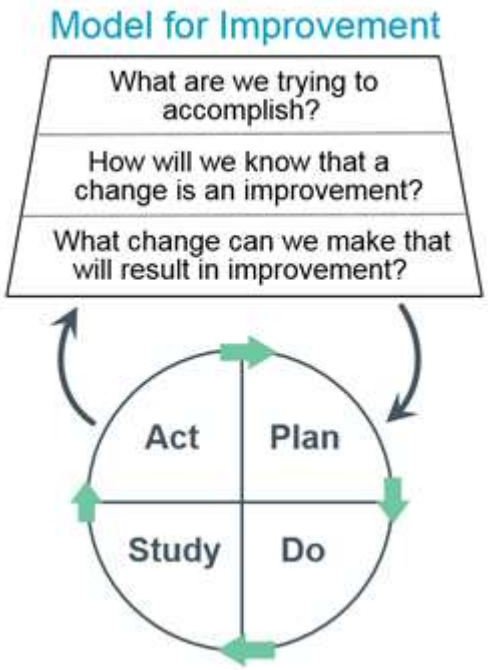
Intervention and Study

This quality improvement project was developed after a 10-day reflective practice of fifty-one patients in my clinical practice. Several findings called for intervention, but the one that stood out more was the high incidence of urinary tract infection and constant antibiotic treatment, even in situations that were not justified. The impact of this intervention stems from proven, evidence-based research with the use of silver alloy-coated urinary catheters to prevent urinary tract infections. outcome

Patients with chronic indwelling catheters appear to have colonized bacteria. Clinicians order unnecessary urine studies due to patients, families, and nursing reports of classic non-UTI symptoms, like agitation, lethargy, and decreased appetite. It is not valid to completely rule out urinary tract infection in these vulnerable patients, but they present without any symptoms, hence with asymptomatic bacteriuria. The principal investigator followed the Standards for Quality Improvement Reporting Excellence 2.0 (SQUIRE) Guidelines during the conduct and reporting process of the quality improvement project. The outcome measures were shown. This was done by the Plan-Do-Study-Act (PDSA) cycle of quality improvement intervention.

Figure 3

Plan-Do-Study-Act (PDSA) Cycle (Institute for Health Improvement, 2021)



The PDSA Cycle includes three fundamental questions that evaluate the project aim before change implementation. It must be measurable in its specificity and address the goal of the proposed intervention. It is essential in finding the feasibility check and

ensuring benefit to the organization. Before the quality improvement project, the process of the PDSA cycle involved is as follows:

Plan: Data collection was done after completing a 10-day reflective practice that showed the frequent diagnosis and treatment of urinary tract infection in a patient with chronic Foley catheter due to bladder dysfunction. Addressing this issue will improve patient outcomes and improve costs for the organization. The main goal is to prevent catheter-associated urinary infections using silver alloy-coated urinary catheters.

D0: Quality Improvement Project began on February 10 to March 17, 2022.

The project began and watched for any catheter-associated adverse effects. One patient's Foley catheter dislodged required reinsertion, and another had a leakage requiring replacement.

Study: Results were analyzed and compared. Out of the five patients that took part in the QI project, two patients' urine specimens were negative, another two patients' urine studies were positive with gram-positive bacteria but remained asymptomatic, and one was symptomatic.

ACT: The QI project showed a decrease in the use of silver alloy-coated catheters in preventing CAUTI. There was no antibiotic treatment during the project. The patient was adequately hydrated. During this stage, changes are noted, refined, and changed if needed, and in the future, this intervention showed the benefits of cost-saving.

Measures

The main outcome was the incidence of UTIs by the time of catheter removal or on the day after catheterization, the event that occurs first. Intention-to-treat analysis was performed, as well as a primary analysis of all patients. Kurt Lewin's change model framework was applied during the project process and the Plan-Do-Study-Act (PDSA) QI model was used in the translation of theory into practice and were both instrumental in organizing and examining the scientific theories within the evidenced-based approach. This quality improvement project was patient-centered, patients were followed and seen face to face to ensure adherence to the new Foley catheter. The principal investigator met with the project chair who oversaw and guided the project process and implementation. Improvement with the silver alloy-coated catheter was noted with laboratory results documented in the EHR

Analysis

Qualitative data analysis was used to characterize the project population for this quality improvement project. Fifty-one patients were seen during a 10-day reflective

practice. Males and females were both included. Other diseases that require intervention were noted, including Pneumonia, osteomyelitis in diabetic patients, and total hip and knee repairs due to recurrent falls, but decided to intervene to prevent catheter-associated urinary tract infection with a special catheter that has been used according to evidence-based literature in preventing CAUTIs. Five patients were included in this quality improvement project, data were collected at the end of the intervention with results illustrated below.

Figure 4

Silver Alloy-Coated Catheter Symptoms in Percentage

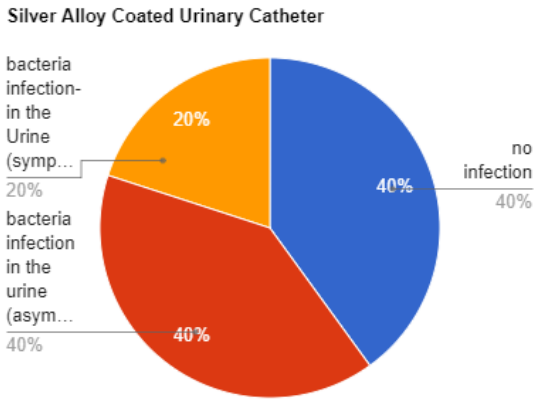


Figure 5

Types of Bacteria Colonization

Type Of Bacteria

#	No Infection	Bacteria Infection in the Urine (Asymptomatic)	Bacteria Infection in the Urine (Sympotomatic w/ UTI)
1	Negative Urinalysis		
2	Negative Urinalysis		
3		Klebsiela Pneumonia	
4	-	E. Coli, ESBL, Pseudomonas Aeriginosa	
5	-		Enterococcus Fecalis, Candida Albicans

Ethical Consideration

All patients that agreed to take part in this quality improvement project willingly consented. The facility staff was educated on the project's aim. No payment of any kind was disbursed to the patients to take part in the project. Patients were solely seen in their rooms. No form of electronics was used to video or audio tape patients, and there was no exposure to health risks. Data were collected and stored in the electronic health record that only the principal investigator used. The facility, Regal Estates assisted living facility was approved for the QI project prior to implementation. The University of Texas at El Paso IRB conducted a review to ensure patient protection and all measures were taken to ensure an ethical QI project.

Results

The quality improvement project was done in a single long-term care facility. The facility is made up of an executive director, a director of nursing services, and other nurses (licensed vocational nurses, medication aides, and care staff). There were seven patients initially, and two were dropped due to medical issues. The remaining five patients completed the intervention for the duration of 5 weeks, 40% had negative urinalysis, another 40% were asymptomatic with multidrug-resistant bacteria, and 20% had no negative urinalysis.

Discussion

Urinary tract infection is one of the most encountered infections in daily clinical practice, and most cases are catheter-related. Although a few clinical practices such as an aseptic technique for catheter insertion, closed drainage systems, and a shorter

duration of catheterization have been introduced to reduce the onset of CAUTI, the incidence still is high. Therefore, research for strategies or modern technologies to prevent CAUTI is still needed. Since the early 1990s, research has focused on different anti-infective catheter-coating materials, but results have been generally inconclusive. A randomized cross-over study by Karchmer et al.,2000, demonstrated that the risk of UTI could be decreased by 21% onwards and by 32% among patients when a noble metal alloy catheter was used instead of a conventional catheter. Since then, more studies to compare anti-infective urinary catheters with conventional urinary catheters have been conducted. The noble metal alloy indwelling catheter has been shown in multiple large clinical trials and smaller case studies to reduce the incidence of CAUTI when compared with conventional catheters. Bactiguard-coated Foley catheters, an essential noble metal (gold, silver, and palladium) alloy, and hydrogel-coated catheters have been introduced to slow bacterial colonization. Additionally, in a study, by Aljohi, Hassan,& Gupta,(2016) the CAUTI-reducing efficacy of silver alloy-coated catheters was evaluated in the Intensive Care Unit (ICU) at the King Fahad Hospital in Saudi Arabia. Results showed the efficacy of silver alloy-coated urinary catheter use and demonstrate a 90% (P = 0.006) relative reduction in the silver alloy-coated catheter group of the CAUTI rate.

Implications and Limitations

The use of a silver alloy-coated urinary catheter potentially reduces the incidence of CAUTI. This will lead to less morbidity and medical costs associated with CAUTI. This quality improvement project was relatively short, 5 weeks, and only done with five patients in a small facility.

Conclusion

The result of this quality improvement project supports the routine use of silver-coated indwelling urinary catheters in patients with bladder dysfunction. One important risk factor for CAUTI and bacteriuria is the duration of catheterization. While it is hypothesized that noble metal coating may reduce the biofilm formation, no material has been found to date that cuts bacterial colonization and biofilm formation; and bacteriuria may only be delayed with such a catheter. Given the morbidity and costs associated with catheter related UTIs, preventive measures have been tried, including the addition of silver coating to urinary catheters.

This QI project type is very significant to nursing practice because they offer the Doctor of Nursing Parctice (DNP) prepared advanced practice registered nurse (APRN) the opportunity to indulge in evidenced-based research, synthesis, critique robust literature reviews, and translate theories and findings into clinical practice. It affords the DNP student the opportunity to practice within the scope of the student's education. Finally, the QI intervention's goal is to improve patient care and outcomes and at the long run save costs. Completing and applying these findings in practice is rewarding for the doctoral-prepared advanced practice nurse. This will ensure that the APRN is well equipped with skills to find gaps in care, contribute to change in healthcare, and improve healthcare delivery.

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