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Reducing the Risk of Indwelling Catheter–Associated Urinary Tract Infection in Female Patients by Implementing an Alternative Female External Urinary Collection Device

A Quality Improvement Project

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ABSTRACT

PURPOSE: The purpose of this quality improvement project was to reduce catheter-associated urinary tract infection (CAUTI) risk for female patients by implementing a female external urinary collection (FEUC) device with suction as an alternative to indwelling catheter (IDC).

PARTICIPANTS AND SETTING: Participants were female patients admitted to our 386-bed community hospital in Southern California and who required urinary management.

APPROACH: We implemented a comprehensive CAUTI prevention program in 2014 that was in place for 1.5 years before this project was started. The CAUTI prevention program was based on the US Center for Disease Control and Prevention's CAUTI prevention recommendations. To supplement our CAUTI prevention efforts in our female patients, we implemented the FEUC device in our intensive care, telemetry, medical-surgical, orthopedic, and acute rehabilitations inpatient care units. Indwelling catheter use and CAUTI cases were identified by our Infection Prevention department.

OUTCOMES: Prior to introduction of the FEUC device, in 2015, the baseline female IDC utilization rate was 31.7% (7181 IDC device-days/22,656 patient-days) and the female CAUTI rate was 1.11 (8 cases/7181 IDC device-days) per 1000 days. Following introduction of the device, both rates declined. In 2016, the IDC utilization rate was 29.7% ($P = .000$) and the CAUTI rate was 0% ($P = .005$). We continued to observe a reduction in 2017 IDC utilization rates of 26% ($P = .000$); the 2017 CAUTI rate of 0.90 was not significantly different to our prior year rate ($P = .726$).

IMPLICATIONS FOR PRACTICE: We found that the introduction of the FEUC device reduced the risk for CAUTI. We will continue to prioritize the use of external devices for urinary management to help reduce the risk of our patients developing CAUTI.

KEY WORDS: Catheter-associated urinary tract infection, CAUTI prevention, External collection device, External wicking device, Female external urinary catheter, Urinary management.

INTRODUCTION

Approximately 12% to 16% of adult hospital inpatients will have an indwelling (urinary) catheter (IDC) at some time during their hospitalization.[1,2] The risk of bacteriuria is 3% to 7% in patients each day a catheter remains indwelling.[1,2] Hospitals risk decreased reimbursement based on the Centers for Medicare & Medicaid Services (CMS) Hospital Value Based Purchasing Program if patients experience never events (preventable outcomes) including catheter-associated urinary tract infection (CAUTI).[3] Most hospitals have adapted the 2014 CAUTI prevention guidelines[2] to help lower CAUTI rates and improve patient outcomes. These guidelines include inserting an IDC only when clinically indicated, along with daily review of its necessity and prompt removal when no longer clinically indicated. The guidelines also recommend use of aseptic technique and using sterile equipment during catheterization, as well as maintenance of the closed drainage system and unobstructed urine flow. In addition to these recommendations, the guidelines support securing the catheter to the patient's leg or abdomen to prevent movement and prevent shearing forces against the urethra, along with routine cleansing of the meatus. All of these recommendations were implemented by our staff, but we continued to have patients develop CAUTI; most were females.

In order to reduce CAUTI risk in our female patients, we sought a noninvasive urinary management device and elected to trial a novel female external urinary collection (FEUC)

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device with suction (PureWick Bard, Covington, Georgia). This FEUC device is designed for female patients; it is placed between the labia majora, and uses wall suction to wick urine away into a collection vessel. The FEUC device adds another option for urinary management in our female patients before an IDC is considered or upon its removal when no longer indicated.

This project aimed to determine if introduction of the FEUC device benefited female patients in terms of preventing CAUTI cases and decreasing IDC device use among hospitalized females. We used baseline data from 2015 and compared them to 2016 and 2017 data following introduction of the FEUC device.

APPROACH

The setting for this quality improvement (QI) project was a 386-bed acute care hospital in Southern California. The project was deemed QI, and not research, and exempted from institutional review board review and approval. We initially evaluated the FEUC device in one inpatient care unit (telemetry unit) to determine if the product met expectations regarding ease of use, reliable urine output measurement, protecting skin from moisture, and comfort. Female inpatients who required urinary management were the population focus and included in our project. We utilized the PDCA (Plan, Do, Check, Act) method to guide and implement this project.

Plan

The FEUC device was trialed September 2015 through December 2015 in our 60-bed telemetry unit. With an average daily census of 50 patients, it serves as a "step-down" unit, providing an intermediate level of care between the intensive care unit and the general medical-surgical unit. During this initial trial period, we used 60 FEUC devices on 30 female patients.

Initial education of the use of the FEUC device was provided by a representative of the product manufacturer to the telemetry unit manager, the nurse educator, and the WOC care nurse along with one-on-one education for RNs on the unit. To ensure proper use and consistency of the device, the indications/contraindications for use given in Table 1 were followed. The educator ensured that all staff members had been given the same education for use of the device. The company representative for the device and the wound care nurse provided ongoing educational support to the staff during the trial.

Do

At the end of the trial period, each nurse on the unit who used the device was given a survey for feedback. The survey results were reviewed and discussed at our January 2016 Shared Governance meeting. This professional practice group is made up of frontline nurse representatives and unit-based educators who meet regularly and discuss practice concerns.

We received positive feedback from this initial trial and elected to expand the evaluation project to other hospital units (intensive care, medical-surgical, orthopedic/neurology, and rehabilitation units). Because postpartum vaginal discharge is a contraindication for use, the Mother-Baby unit was excluded. Our progressive care unit that provides care to incarcerated patients was also excluded. It primarily cares for male patients.

Nurses from the Shared Governance group volunteered to be "champions," enabling implementation of this practice change on their units. They provided education and demonstration of application and use of the FEUC device to RNs and nursing assistants on each of the units. Nursing assistants were able to place or remove the FEUC device to help support the nurses' workload. A physician's order was not required for this device; this decision was made because the device was noninvasive and sufficiently similar to practice related to the use of condom catheters in male patients, which do not require a provider's order. Eligible patients were identified via regular (daily rounds) of female inpatients on the participating units.

Check and Act

Following data collection for 1 year after using the FEUC device, Infection Prevention staff reviewed data to compare 2015 and 2016 IDC utilization and CAUTI rates in female patients. Based on these findings, we elected to expand use of the FEUC device hospital-wide. We observed that the relatively rapid hospital-wide adoption of this practice change was facilitated by Infection Prevention sharing data regarding CAUTI occurrences with regular use of the FEUC device and ongoing encouragement of device use by unit-based educators. We also ensured that new staff members were educated about device use.

OUTCOMES ANALYSIS

Diagnosis of a CAUTI was based on evaluation of all female patients with positive urine cultures to determine if they met US Center for Disease Control and Prevention/National

TABLE 1.
Indications/Contraindications for Use of Female External Urinary Catheter

Indications for Use	Contraindications for Use
Female patients	Female patients with urinary retention
Patients requiring urine output monitoring who do not meet indications for indwelling urinary catheterization	Patients with male genitalia
Urinary incontinence and/or frequent urination	Agitated, combative, or uncooperative and might remove device
Difficulty walking from the bed or chair to toilet	Frequent episodes of stool incontinence without a fecal management system
Difficulty using bedpan	Experiencing preexisting skin breakdown at the site
Postsurgical or procedure immobility	Experiencing moderate/heavy menstruation and cannot use a tampon
Skin injury or irritation related to urinary incontinence or diapers	Postpartum patients with vaginal discharge
Bed rest orders	Patients who are mobile and able to safely ambulate to the restroom

Healthcare Safety Network (CDC NHSN) criteria.[4] An initial report was completed on monthly basis identifying the number of patients who had an IDC noted in the chart; this list was edited to include only female patients. Data Support staff then provided an annual report of the number of female patients managed by an IDC.

The yearly female IDC device-days were divided by the yearly female patient-days to determine the IDC device utilization rate. The yearly number of CAUTI cases for female patients was divided by the number of female IDC device-days to determine the CAUTI rate. The software program used for statistical analysis was the CDC NHSN statistical calculator that uses SAS Macros (SAS, Cary, North Carolina). We compared baseline data, obtained from calendar year 2015, to calendar 2016 data (obtained after FEUC device introduction) to determine any differences. We also compared 2016 and 2017 data to determine if outcomes persisted over an additional 12-month follow-up period.

OUTCOMES

Findings revealed 7181 female IDC device-days out of 22,656 female patient-days among participating units (31.7% IDC utilization rate). During 2016, the IDC utilization rate was 6849 female IDC device-days out of 23,076 female patient-days (29.7% IDC utilization rate), reflecting a decline in IDC utilization ($P = .0000$). To determine sustainability of this outcome, we calculated our 2017 IDC utilization rate; it was 5558 female IDC device-days out of 21,345 female patient-days (IDC utilization of 26.0%); this rate was also lower than the 2015 baseline utilization rate of 31.7% ($P = .0000$) (Table 2).

Due to limitations with our data collection tools, we were not able to calculate the number of days female patients had an FEUC device. We were only able to rely on data from our Purchasing department to determine the use of the FEUC device. In 2015, we were given 60 counts of product to trial, then in 2016 we purchased 6695, and in 2017 we purchased 13,219. This increase in product purchase by our supply chain suggests the product was being used and correlated with our decrease in IDC utilization.

We also evaluated CAUTI occurrences following introduction of the FEUC device. During 2015, 8 female patients experienced CAUTI out of 7181 IDC device-days, yielding an incidence of 1.11 CAUTIs per 1000 IDC device-days. In 2016, the CAUTI rate was 0 out of 6849 IDC device-days ($P = .0047$). In 2017, 5 female patients met CDC NHSN criteria for CAUTI out of 5558 IDC device-days, yielding an incidence of 0.90 CAUTIs per 1000 IDC device-days. These incidence rates did not significantly differ from 2015 baseline incidence rates ($P = .7262$).

DISCUSSION

Catheter-associated urinary tract infection prevention has become a major focus for many hospitals.[5,6] The latest guidelines for CAUTI prevention have been adopted by many facilities in order to achieve this goal. Adherence to CDC NHSN CAUTI prevention components has been shown to reduce CAUTI rates in many studies.[2] We reviewed the literature and found a multiple case series that described experiences with a similar device in 3 female patients.[7] Based on these experiences, they concluded that the FEUC device is a feasible alternative to an IDC for managing urinary incontinence. Data related to CAUTI prevention or reduced IDC utilization were not discussed. During the Association of Professionals in Infection Control and Epidemiology 46th Annual Educational Conference in June 2019, 3 oral abstracts were presented that also used the FEUC device.[8-10] All compared IDC utilization and CAUTI rates; one reported a significant reduction in IDC utilization but no significant changes in CAUTI rates.[8] Two abstracts found significant reductions in CAUTI and IDC utilization rates.[9,10]

Based on our experiences, we believe that educating both RNs and nursing assistants contributed to project outcomes and rapid use of the product in all of the units we studied. In addition, our Infection Prevention department was already collecting CAUTI and IDC utilization data, which enhanced our ability to determine rates in female patients on participating units.

The limitations to our QI project include our data systems not being set up in time to collect the number of days the FEUC device was used. Instead, we are only able to report changes in the number of products purchased within data collection periods. We therefore recommend creating electronic data collection systems before starting a project.

We did not perform any compliance audits for the CAUTI bundle as they were considered standard practice. It is possible that there may have been an improvement with CAUTI bundle compliance during the postintervention period that contributed to improved rates, but these data were not tracked. We recommend auditing your facility's CAUTI bundle compliance before and following introduction of an FEUC device to ensure ongoing adherence and strengthen the correlation between device introduction and changes in IDC utilization rates. Although we observed a decrease in CAUTI cases in the first year following introduction of the FEUC device, this reduction was

TABLE 2.
Data for IDC Utilization and CAUTI Rates (Female Only)

	2015	2016	*P*	2017	*P*
CAUTI cases	8	0		5	
IDC device-days	7,181	6,849		5,558	
Patient-days	22,656	23,076		21,345	
IDC utilization rate	31.7%	29.7%[a]	.000	26%[a]	.000
CAUTI rate per 1000 IDC device-days	1.11	0.00[a]	.005	0.90	.726
FEUC product (count)	60	6,695		13,219	

Abbreviations: CAUTI, catheter-associated urinary tract infection; FEUC, female external urinary catheter; IDC, indwelling urinary catheter.
[a]Statistically significant decrease with *P* value of less than .05.

not sustained during year 2. This variability in CAUTI incidence rates may be attributed to a number of factors including difference in IDC rates in individual patients and changes in the application of other CAUTI preventive interventions.

CONCLUSION

We introduced an FEUC device and were able to reduced IDC utilization days in female patients over a period of 2 years. Our CAUTI incidence declined over the first year following device use, but the incidence rose during year 2 following introduction. Findings of our QI project suggest that a consistent, comprehensive, interdisciplinary approach to assess CAUTI bundle compliance that included an FECU device may reduce both IDC utilization and CAUTI rates.

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