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Reducing Urinary Tract Infections in Adult Hospitalized Patients during the COVID-19 Pandemic: A Quality Improvement Project

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ABSTRACT

Background: Catheter-associated urinary tract infections (CAUTIs) remain among the most common healthcare-associated infections, leading to increased morbidity and mortality in hospitalized adult patients.

Methods: An interdisciplinary team initiated a quality improvement project to help reduce CAUTIs in a South Florida hospital. The project included using a CAUTI bundle consisting of indwelling catheter protocols, electronic bladder management order sets, nursing staff education, and implementation of external urinary catheters during the years 2020 through 2022.

Results: The CAUTI bundle demonstrated positive outcomes in decreasing CAUTI rates. During our fiscal year 2022, there were 63% fewer CAUTIs ($n = 23$) compared to 2020 ($n = 62$).

Conclusion: We reached our organizational goals of decreasing CAUTI rates to 10% below the national benchmark and improving patient outcomes.

Keywords: Catheter-associated urinary tract infection, CAUTI, indwelling urinary catheters, external urinary catheter, quality improvement, COVID-19, bundle

INTRODUCTION

Preventing catheter-associated urinary tract infections (CAUTI) remains a national patient safety priority for many healthcare organizations. Catheter-associated urinary tract infections remain one of the leading causes of infection within hospital systems, resulting from indwelling urinary catheters (Robinson, 2021). The reduction of all hospital-acquired infections (HAIs) is significant to healthcare systems, contributing to shorter hospital stays, decreased use of antibiotic therapies, and 9.8 billion dollars in cost savings annually (CAUTIs account for

one-quarter of healthcare costs) (Russell et al., 2019). According to the Healthcare Infection Control Practices Advisory Committee (HICPAC, 2019) from the Centers for Disease Control and Prevention, 15% to 25% of hospital patients will acquire a urinary catheter infection during their hospital stay. Catheter-associated urinary tract infections are also associated with negative consequences, including increased morbidity and mortality from secondary bacteremia, multidrug resistance, and prolonged hospitalization (Hollenbeak & Schilling, 2018).

The Centers for Medicare and Medicaid Services (CMS) have increased accountability measures for healthcare systems to report CAUTIs to the National Healthcare Safety Network (NHSN, 2023a). Catheter-associated urinary tract infections have been classified as *never events*, wherein a patient's hospital treatment for these and other preventable HAIs would not be reimbursed by CMS (Kuy et al., 2020). In 2016, The Joint Commission added the prevention of CAUTIs as a National Patient Safety Goal, requiring hospitals to implement evidence-based practices to prevent CAUTIs (Snyder et al., 2020). In response to these changes, many healthcare organizations have implemented patient safety initiatives to prevent CAUTIs and other HAIs (Van Decker et al., 2021).

Some healthcare systems have focused on initiatives to change practices to improve the quality of care and patient outcomes while reducing healthcare costs. Nursing practices have shifted toward bundles or a combination of evidence-based practice measures, especially when it is believed that 65% to 70% of hospital CAUTIs may be preventable (Bagley & Severud, 2021). These measures have involved debriefing tools, revisions to urethral catheter kits, nursing protocols to discontinue indwelling catheters, and best practice alerts implemented in the electronic medical record (Rhee et al., 2016). Other practices, such as the use of external urinary catheters in place of indwelling catheters, have been documented. However, their use continues to be limited (Zavodnick et al., 2020). This article aims to describe the process of implementing a quality improvement project at an acute care hospital in the United States during the coronavirus disease 2019 (COVID-19) pandemic to reduce the number of CAUTI cases. We describe the implementation of a CAUTI bundle, including changes in protocols, order sets in the electronic medical record, staff education, and utilization of external urinary catheters to decrease the CAUTI rates.

Setting

The setting for our project was an urban, faith-based, non-profit South Florida hospital in Miami, with 923 beds and an average daily census of 578 patients.

Problem

The COVID-19 pandemic impacted the U.S. healthcare system, straining hospital operations and resources from 2019 to 2021. By early December 2020, many healthcare systems experienced increased HAIs, especially CAUTIs (Fakih et al., 2022). According to the NHSN, the U.S. benchmark for CAUTIs was 0.863 for fiscal year 2019 (HICPAC, 2019). The NHSN uses the standardized infection ratio (SIR) as the benchmark measure to track national, state, or local HAIs (NHSN, 2023b). In 2019, our CAUTI rate was below the U.S. benchmark (0.793 or 14/17.659) (Table 1). Then, in 2020, our rates tripled to 1.102 (44/20.934).

METHODS

Plan

The Plan-Do-Study-Act (PDSA) cycle was the methodology used to implement this quality improvement project (Institute for Healthcare Improvement, 2022). From January through March 2021, the Clinical Practice Council, an interdisciplinary group of nurse leaders, nurse educators, infection control preventionists, medical providers, dietitians, patient safety officers, quality improvement leaders, and direct care nurses gathered to review our organization's practices. We developed a plan to implement evidence-based practice changes to prevent CAUTIs. The committee met monthly to review the improvement plan and monitor quality measure scores at the departmental and organizational levels. Our infection prevention department performed monthly audits on the number of days, dates of insertion and removal, discharge, and laboratory results for patients with indwelling urinary catheters from 2019 to 2020. Their audits indicated that patients were being over-catheterized, especially in the

emergency department and critical care areas.

While our efforts to prevent CAUTIs were impacted by the COVID-19 pandemic, as an organization, we believe that CAUTIs can be preventable events. Our organizational goal was to decrease CAUTI rates to 10% below the national benchmark. Additional measures needed to be implemented to promote change toward reducing CAUTIs. There was a need to reevaluate practices for patients who needed an alternative to indwelling urinary catheters.

Do

In March 2021, the committee developed a removal of indwelling urinary catheter protocol (Figure 1). A CAUTI prevention educational handout was then created by the organization's Clinical Nurse Educators (Figure 2). The indwelling urinary catheter protocol (Figure 1) was initially developed and implemented in the critical care unit. Then, it was implemented in the remaining nursing units. The purpose of the protocol was to promote the use of external catheters instead of the insertion of indwelling urinary catheters when possible. The CAUTI prevention educational handout (Figure 2) focused on the importance of assessing patients' need for a urinary catheter every shift, ensuring that there were no loops or kinks in the urinary catheter, securing the urinary catheter to the patient, performing perineal care daily and as needed, hanging the drainage bag below the level of the bladder and off the floor, and protecting the closed drainage system by not breaking the catheter red seal.

From August to September 2021, there were 2,000 nurses from the day and evening shifts who completed mandatory training on the CAUTI prevention practices described above. This represented 100% of the clinical nurses employed at this hospital. A multimodal approach was used to educate all the clinical nurses within the hospital. These included online

education, live "Hospital Acquired Conditions" fairs, and unit in-services. Nurses were taught to identify appropriate indications for using an indwelling catheter, emphasizing the prevention of unnecessary insertion. They were also taught proper hand hygiene, perineal hygiene, and documentation. At the department level, nurse educators ran education huddles, in-services, and skill practice sessions to disseminate education on the CAUTI bundle and indwelling urinary catheter removal protocol. Unit nurses were educated on indications for indwelling catheter use such as acute urinary retention or obstruction, comfort measures during end of life, hematuria requiring continuous bladder irrigation, incontinence with open sacral or perineal wound, neurogenic bladder, prolonged immobilization, surgical procedure, or strict urine output monitoring. During monthly staff meetings, leaders increased staff awareness by sharing the results from the infection control quality audits. To encourage staff buy-in to the process, measures were reported in several days without CAUTI infections or "CAUTI-free."

Study

During the third quarter of 2021, 20 CAUTI occurrences were reported. The Clinical Informatics Department developed an Evidence-Based Clinical Care bladder management/urinary retention order set based on existing protocols for patients with and without indwelling catheters (Figures 3 and 4). They developed these electronic order sets in collaboration with the Clinical Practice Council members. The order sets were part of a system-wide standardization strategy for bladder management practice. This strategy helped nursing staff manage patients' urinary retention while promoting comfort and quality of care and reducing the rate of HAIs. Therefore, nurse educators educated the clinical nurses on these order sets during staff meetings and department huddles. New nurses were trained during orientation

using online modules. Those struggling with implementing these practices continued to receive education via in-services and one-on-one training.

Act

A system-wide rollout on applying the indwelling, intermittent, and external catheter kits occurred in October 2021. Then, from October through December 2021, there was a transition to an improved external urinary catheter for male and female patients. The products were more flexible, allowing them to be molded into different body contours. These catheters also had a more extended suction connection, keeping suction tubing away from the patient's abdomen. The nursing staff ($n = 2,000$) was then educated on the improved product in the nursing units. An instructional video was also made available in the organization's online education system for the nurses who could not attend the live sessions. Other measures included the re-education of the nurses on the importance of CAUTI prevention (Figure 2). Nurses were also re-educated on the documentation of catheter care in the electronic medical record and during shift hand-off reports. Quarterly audits on the utilization of the external male and female catheters showed increased utilization, suggesting their alternative use to indwelling urinary catheters (Figure 5). After the education rollout, the electronic bladder management/urinary retention order sets were released in December 2021.

RESULTS

As a result of the implementation of the interventions described above, the CAUTI rate decreased from 2.102 (44/20.934) in the fiscal year 2020 to 0.243 (7/28.727) in the fiscal year 2022. This represented 63% fewer CAUTIs in the year 2022 compared to the year 2020 (Table 1). Results from the quarterly audits on external catheter utilization showed increased utilization of catheters (Figure 5). The increased utilization of female catheters over male catheters was an

interesting finding, which may warrant further exploration. A noticeable improvement in the number of CAUTIs was achieved by 2022 after implementing the prevention bundle protocol, order sets, nursing education, and external catheter products.

DISCUSSION

Catheter-associated urinary tract infection prevention remains a top priority for healthcare organizations. The COVID-19 pandemic presented significant challenges to preventing HAIs, especially CAUTIs. An interdisciplinary approach contributed to the success of this organization's initiative to decrease CAUTI rates. Adherence to CAUTI prevention bundles has been shown to reduce CAUTI rates, and the literature continues to validate this.

The data obtained by our Infection Control and Performance Improvement departments from their quality audits helped identify improvement opportunities with nursing staff education on alternatives to indwelling catheter use. Implementation of the bladder management order set by the Informatics team was also instrumental as it provided nurses with more autonomy in managing patients' urinary retention, promoting their comfort while delivering quality care, and reducing the rate of HAIs. The education the nurse educators delivered to the nursing staff using various modes, including in-services, health fairs, and online education, was also critical to the success of this quality improvement initiative. We concur with previous studies indicating that external urinary catheters significantly decrease patient CAUTI rates. Using external catheters may also reduce the insertion of indwelling urinary catheters (Zavodnick et al., 2020).

Limitations

Limitations of this quality improvement project included that it was implemented in an urban, faith-based, non-profit, adult acute care facility; the findings may not be generalized to patient populations in

other settings. Furthermore, the reported data reflects the CAUTI state of our organization during the COVID-19 pandemic. Other limitations of this project included barriers such as time constraints, lack of staff buy-in, and hardwiring the process.

CONCLUSION

We described the process of implementing a quality improvement project to reduce CAUTI cases in an urban, non-profit, acute care organization during the COVID-19 pandemic. This project was successful because of the interdisciplinary collaboration in the education of nursing staff and the implementation of protocols, bundles, and alternatives to indwelling catheters. Reduction of CAUTI rates can benefit both patients and the organization. The patients will experience fewer catheter insertions, a shorter length of stay, and fewer readmissions. Healthcare organizations will benefit from increased patient satisfaction and reduced financial costs (Baker et al., 2022).

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Table 1

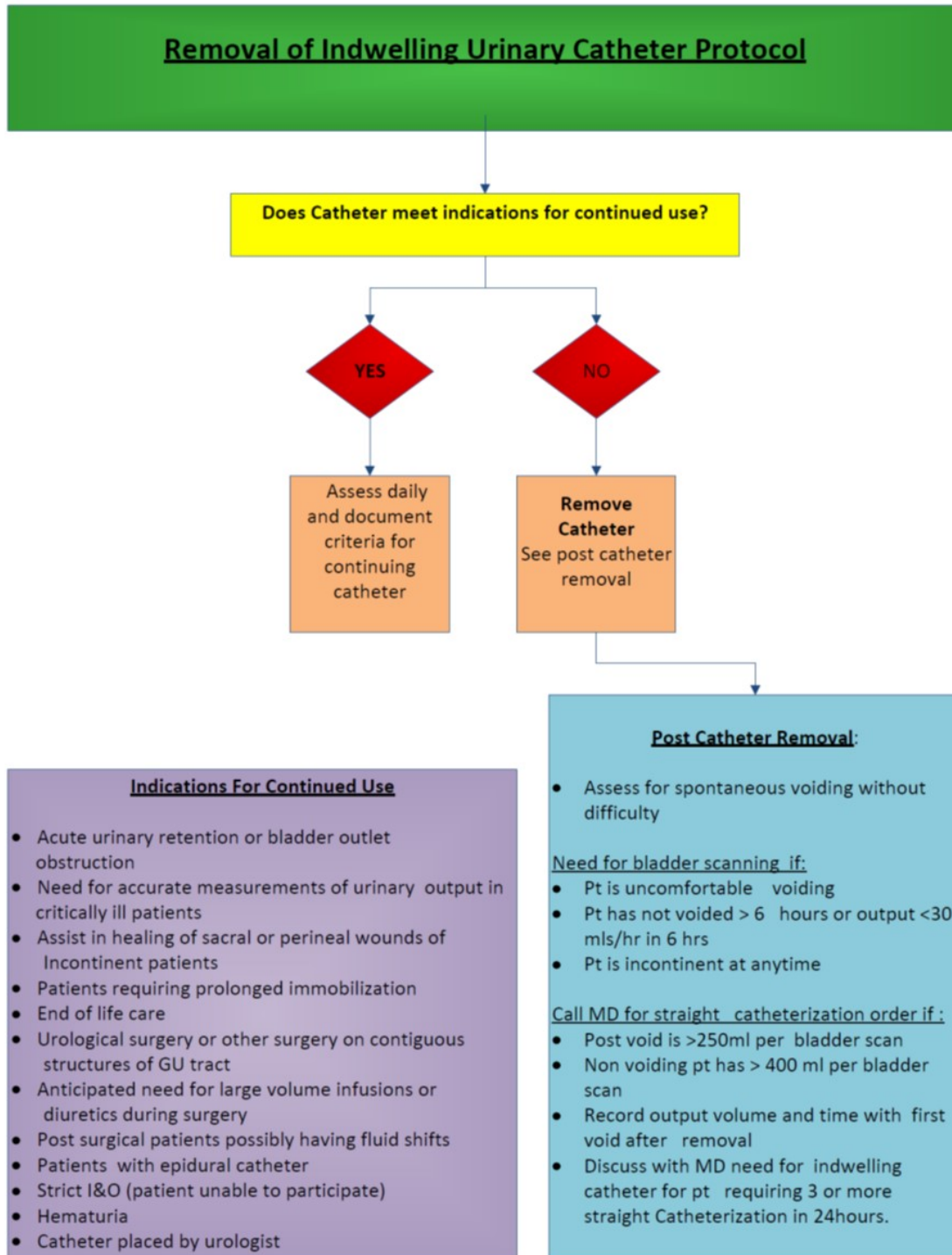
Number of CAUTI Occurrences and SIR by Fiscal Year 2019-2023

Fiscal year	2019	2020	2021	2022	2023		
					Q1	Q2	Q3
No. CAUTI occurrences	22	62	48	23	2	7	3
SIR	0.793	2.102	1.297	0.243	0.138	0.668	0.219
National Benchmark	0.863	0.782	0.718	0.766	0.793	0.793	0.793

Note. CAUTI: Catheter-Associated Urinary Tract Infection; SIR: Standardized Infection Rate. Table depicting CAUTI occurrences and SIR from 2019-2022. Fiscal year 2023 depicts quarterly data.

Figure 1

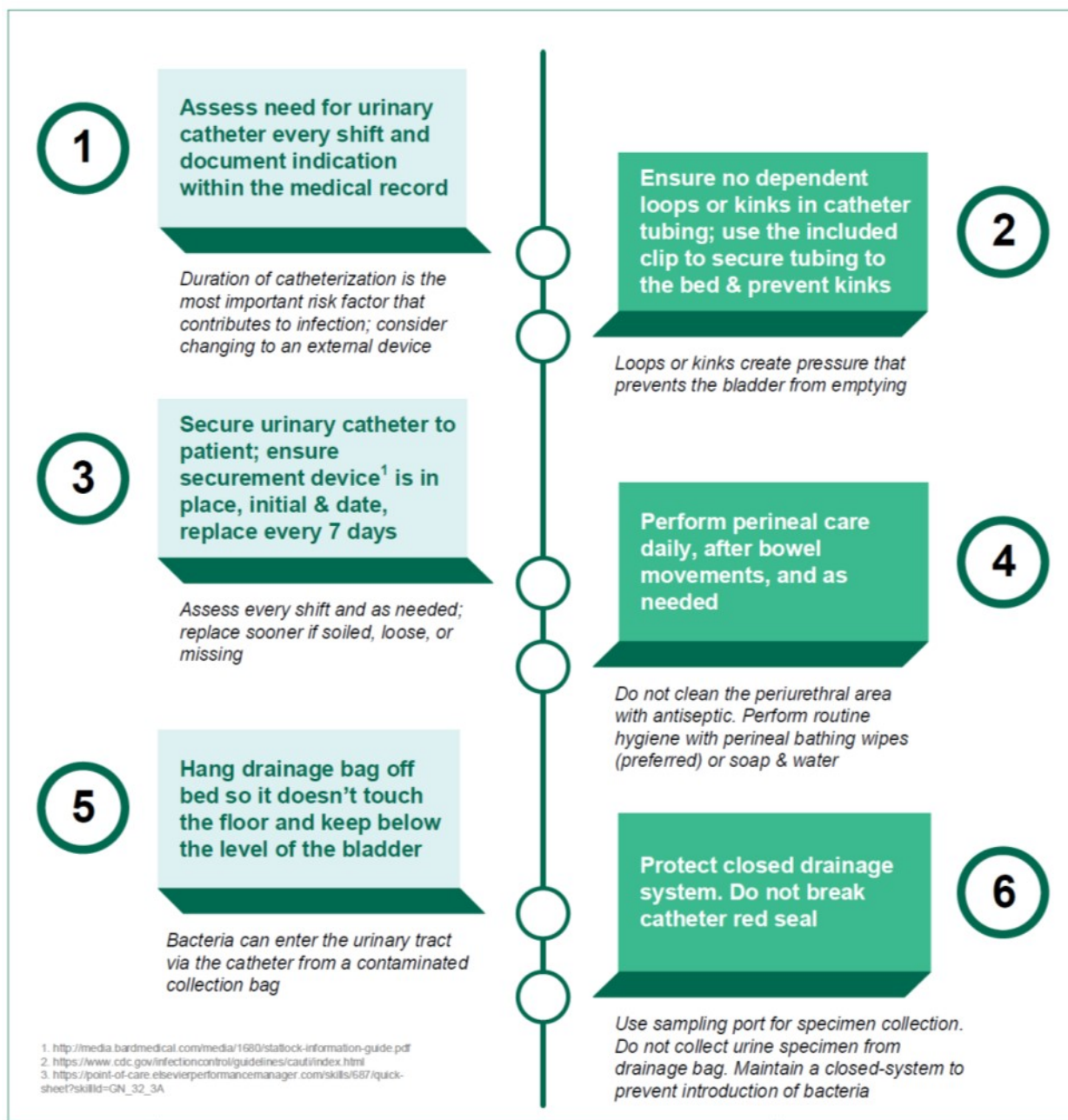
Removal of Indwelling Catheter Protocol



Note. Algorithm depicting criteria for indwelling catheter removal.

Figure 2

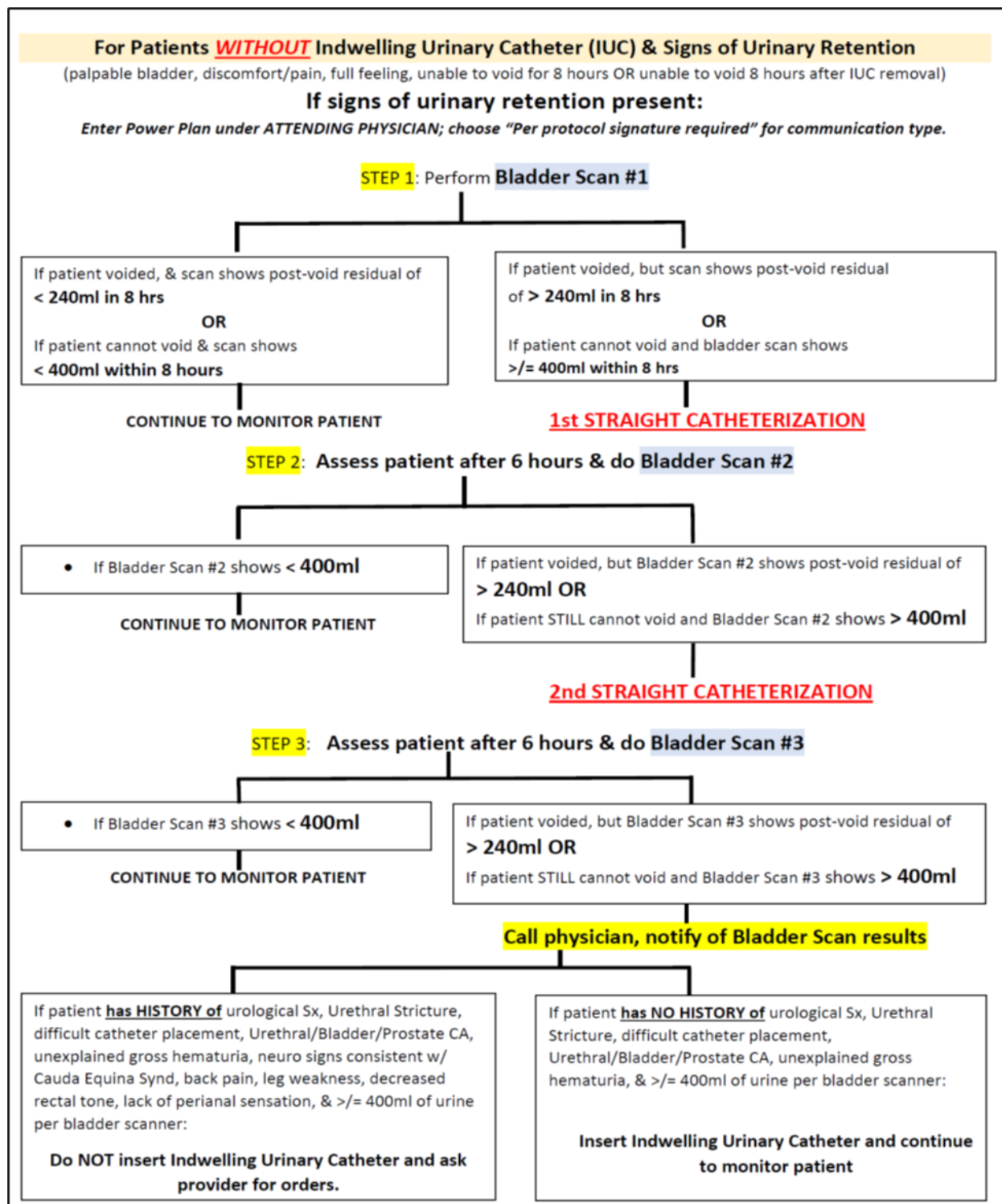
CAUTI Prevention Educational Handout



Note. Permission obtained from Evidenced-Based Clinical Care (Lopez, 2021).

Figure 3

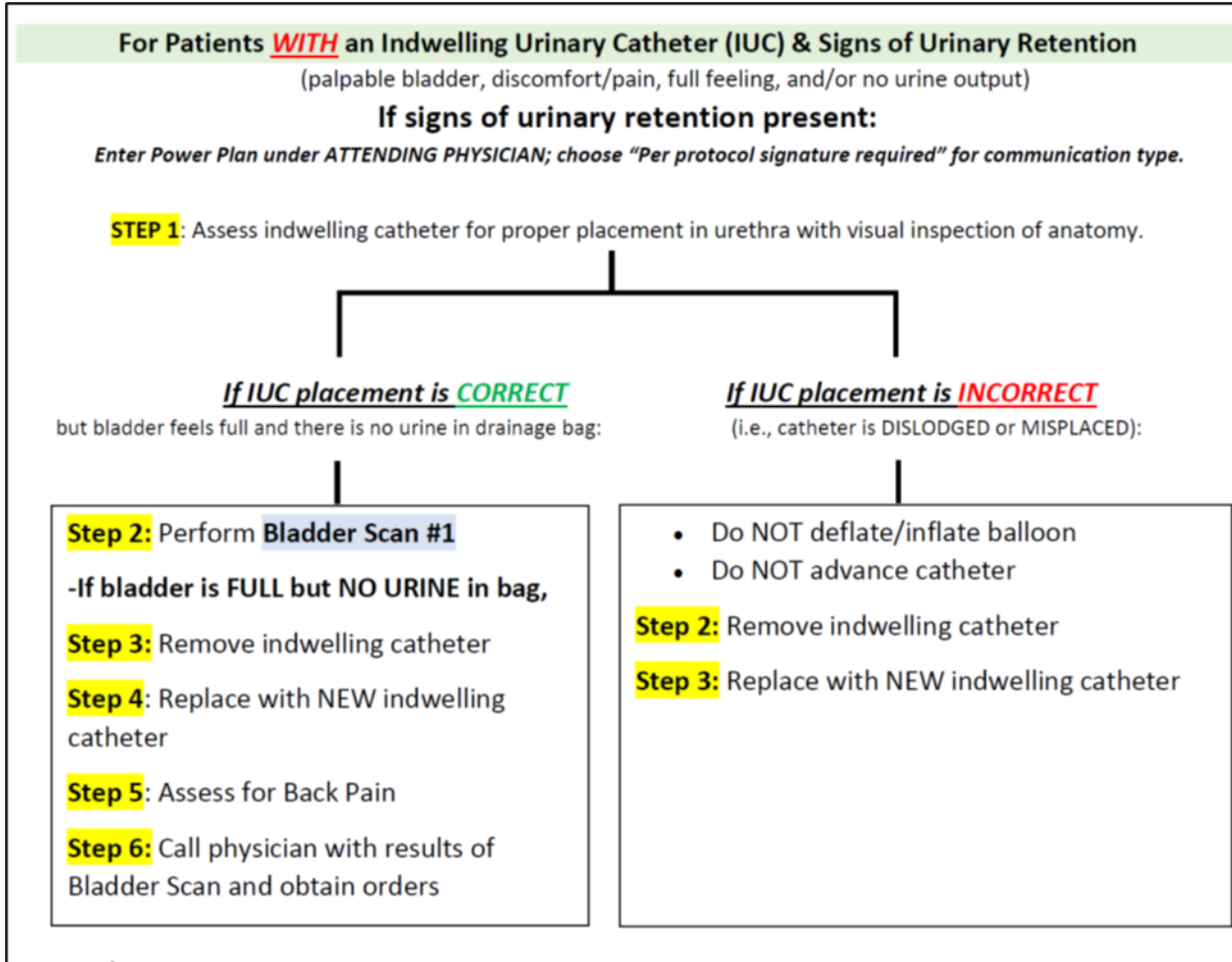
Protocol for Patients without Indwelling Catheters and Signs of Urinary Retention



Note. Algorithm depicting criteria for patients without IUC to catheterize when experiencing signs of urinary retention.

Figure 4

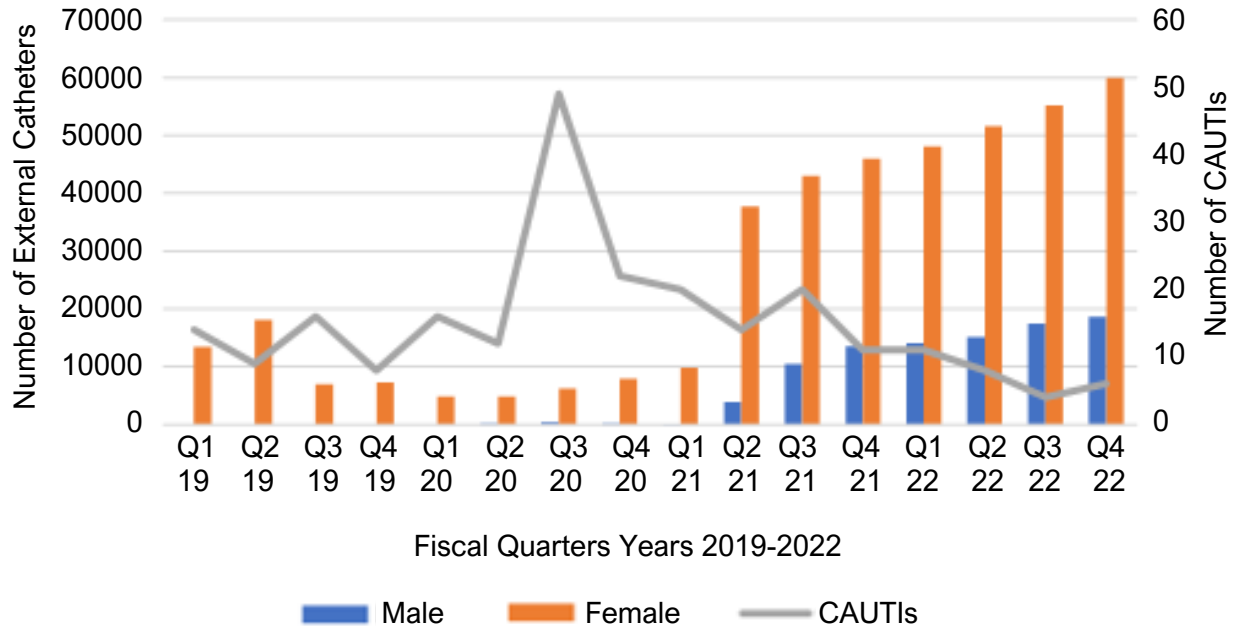
Protocol for Patients with Indwelling Catheters and Signs of Urinary Retention



Note. Algorithm depicting criteria for patients with IUC to catheterize when experiencing signs of urinary retention.

Figure 5

Number of CAUTI and External Catheter Use



Note. Male and Female External Catheter Use versus CAUTI Events.