

Decreasing Catheter-Associated Urinary Tract Infections in Urologic Oncology Patients Discharged With an Indwelling Urinary Catheter: A Quality Improvement Project

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Purpose: Few strategies exist regarding decreasing catheter-associated urinary tract infections (CAUTIs) in the outpatient urologic oncology population discharged with an indwelling urinary catheter (IUC).

Design: A quality improvement methodology using a premeasurement-postmeasurement structure was used to study the impact of process interventions on reducing CAUTIs.

Methods: Creation of IUC outpatient materials, an "IUC Removal Form," and bundling IUC supplies were translated to an outpatient and perioperative setting to reduce CAUTIs.

Findings: The CAUTI rate in urologic surgical patients requiring an IUC at discharge decreased from 12.5% to 8%. Preoperative IUC education increased from 0% to 100%. The average number of days the IUC was present was unchanged. The average postanesthesia care unit length of stay decreased from 1.98 to 1.32 hours, saving the organization \$11,880.00. IUC removal appointments at discharge increased from 4% to 33% ($P = .0146$).

Conclusions: Implementation of consistent patient education and improved process for IUC removal reduced CAUTIs in this population.

Keywords: catheter-associated urinary tract infection, quality improvement, hospital acquired conditions, patient education.

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ALTHOUGH PREVENTION OF catheter-associated urinary tract infections (CAUTIs) has been explored extensively in the inpatient practice environment, little exists in the literature regarding processes to help decrease CAUTIs in the *outpatient* setting. This quality improvement project (QIP) focused on decreasing patient harm in the form of CAUTIs in patients with urologic oncology diagnoses who were discharged with an indwelling urinary catheter (IUC) after urologic surgical procedures. A lack of formalized patient education and clinical practice processes associated with scheduling postoperative appointments were found to be opportunities to improve care procedures to reduce the risk of potential patient harm, defined as a CAUTI.

Patients from the urologic oncology clinic (UOC) were the primary focus for this QIP as they frequently are discharged from the postanesthesia care unit (PACU) with an IUC. A review of postdischarge phone calls from 92% of patients discharged from the PACU with an IUC reported that they did not or could not remember receiving preoperative education regarding care of the device. In addition, the UOC patients who had the potential to be discharged with an IUC received little preoperative education concerning home care for the IUC. A retrospective review of UOC patients discharged with an IUC found a 12.5% CAUTI rate. The presence of a CAUTI also increases the risk of patient morbidity and mortality. This QIP sought to reduce the risk of CAUTI in surgical oncology patients through a multimodal preoperative education program geared toward care of an IUC at home and by initiating clinical practice processes that optimized scheduling the removal of the IUC as soon as possible.¹⁻⁴

Available Knowledge

CAUTIs have become a burdensome issue in health care.¹ The incidence of CAUTI varies depending on the clinical setting and the definition used to define this hospital acquired condition, making the true incidence difficult to assess.⁵ Despite the widespread variation in reporting CAUTI rates, it has been estimated that 1 million cases occur each year with 70% to 80% being attributed to an IUC.^{6,7} Adverse outcomes associated with CAUTI include an increased length of stay (LOS), increased patient risk of sepsis, increased hospital costs, decreased patient satisfaction, and increased risk of morbidity and mortality.^{3,7-9}

Evidence supports the use of patient education to decrease IUC complications.^{1,3,6,10,11} Inman et al¹⁰ conducted a nonrandomized prospective study that found significant decreases in reported anxiety and LOS in patients who attended a preoperative prostatectomy educational class compared with those patients who received usual care. Purposeful patient education delivered at the right time and right place is a key to the successful retention of the educational materials.¹²⁻¹⁴ For maximum effectiveness, educational materials should be delivered using a variety of formats while acknowledging a diverse patient population.^{12,15-17}

“Bladder bundles”—evidence-based strategies performed together—have also been shown to be an effective strategy to decrease CAUTI.^{1-3,6,7,11} Interventions identified in bladder bundles include patient and staff education concerning insertion and care of the IUC and alternative approaches to using an IUC.^{1-3,6,7,11} Clinician-driven protocols for inserting and discontinuing IUCs as soon as possible are important to include in bladder bundles as prolonged catheterization has been shown to be a major contributor to CAUTI.^{2,18} The daily risk of acquiring bacteriuria is 3% to 7% while the IUC is in place.^{3,19} However, the prolonged use of an IUC to promote healing after a urologic procedure is commonplace, posing a unique layer of complexity in addressing the problem of CAUTIs in the urologic oncology patient population.⁵

CAUTIs are a significant clinical problem for urologic oncology patients who require an IUC postoperatively as the device increases the risk of infection yet is required to assist with healing. This QIP implemented an evidence-based preoperative educational program and improved clinic scheduling processes to reduce the CAUTI risk for urologic oncology patients discharged home with an IUC.

Specific Aim

The aim of this QIP was to decrease, within 1 year, the rate of CAUTI diagnosed within 21 days of temporary IUC insertion from 12.5% to 0% in UOC adult patients discharged with a temporary IUC after a short stay. Process aims to achieve this goal included: (1) increase the percentage of patients receiving IUC preoperative educational materials from 0% to 50%; (2) increase the percentage of patients who indicate they received instructions caring for their IUC from 6.7% to 50%; (3) decrease the average LOS in the PACU from 1.98 to 1.58 hours (20% reduction); (4) decrease the average number of days the IUC is in place from 5 to 4 days for transurethral resection of the prostate (TURP), transurethral resection of bladder tumors (TURBTs), and cystoscopy with bladder biopsy or bladder tumor removal (CBT) patients; (5) decrease the average number of days the IUC is in place from 8 to 6 days for radical prostatectomy (RP) patients; and (6) increase the percentage of TURP, TURBT, CBT, and RP patients who

have a postoperative appointment for IUC removal at discharge from 4% to 50%.

Description of People Involved

An interdisciplinary team consisting of physicians, PACU and UOC clinic nurses, nurse managers, and medical assistants was formed to participate in the QIP project.

Methods

Context

The setting for this QIP was a 620-bed academic medical center with associated specialty practice outpatient clinics located in the Mountain Region in the United States. The population for this QIP was adult UOC patients who had a surgical procedure as part of their treatment plan and were discharged with a temporary IUC after a “short stay” at this hospital. Short stay was defined as adult UOC patients discharged: (1) from phase II level of care in the PACU; (2) on postoperative day 1 from the inpatient unit, or (3) from the UOC. Phase I level of care includes postoperative monitoring of the patient’s airway, fluids, hemodynamics, and pain management. Phase II level of care prepares the patient for discharge to home.²⁰ The most common UOC procedures requiring an IUC on discharge were TURP, TURBT, CBT, and RP for cancers of the bladder and prostate.

Because of the specific surgical population targeted for this QIP, the National Surgical Quality Improvement Program (NSQIP) definition of postoperative urinary tract infection (UTI) was used to define CAUTI. The NSQIP definition of postoperative UTI evaluates clinical symptoms of fever, urgency, dysuria, and presence of white blood cells in the urine.⁵ Because an IUC is frequently left in place for several weeks after a urologic surgical procedure to allow for healing, the timeframe of diagnosing a CAUTI within 21 days of temporary IUC insertion was used.

Interventions

A fishbone diagram was constructed to identify potential elements that may contribute to the problem of CAUTIs in urologic oncology patients and

inform interventions used in the QIP (Figure 1). The QIP involved two strategies to reduce CAUTI risk: (1) developing and implementing a robust preoperative educational program regarding management of an IUC at home, and (2) decreasing the number of days the IUC was in place by establishing a process for scheduling a follow-up appointment for IUC removal before patient discharge from the hospital.

The educational program consisted of augmenting UOC and PACU nursing staff’s preoperative verbal and written instructions about care of an IUC at home with an educational video and short brochure. The instructional video was reviewed or watched in the UOC during the patient’s preoperative visit and again in the PACU before discharge. Patients were also given a copy of the video by the UOC nurses. The brochure was also given to the patients by the UOC and PACU nurses. In addition, patients discharged from the PACU received an “IUC Care Packet” containing materials necessary for IUC care that were demonstrated in the educational video: gloves, alcohol wipes, large urinary drainage bag, small leg bag, sterile cap, and extension tube. These supplies were already stocked in the PACU and were being given to patients on discharge, but bundling them into one easy-to-access IUC Care Packet helped decrease the nursing time spent gathering the supplies before discharge, ensured all items for IUC care were provided, and was a cost neutral and efficient patient-centered process.

The process for scheduling a follow-up appointment for IUC removal before discharge was implemented in the UOC and the PACU. The UOC patient scheduler was encouraged to continue to schedule postoperative IUC removal appointments at the same time all appointments associated with the surgical procedure were planned. The IUC removal appointment was automatically populated within the electronic health record in the patient’s discharge instructions when made preoperatively by the UOC scheduler. However, before this QIP, the appointment was not identified as being for IUC removal. This system worked well for most RP procedures whose length of IUC placement was known before the surgical procedure, but was not optimal for other UOC patients. For patients undergoing the TURP, TURBT, and

Fishbone Diagram

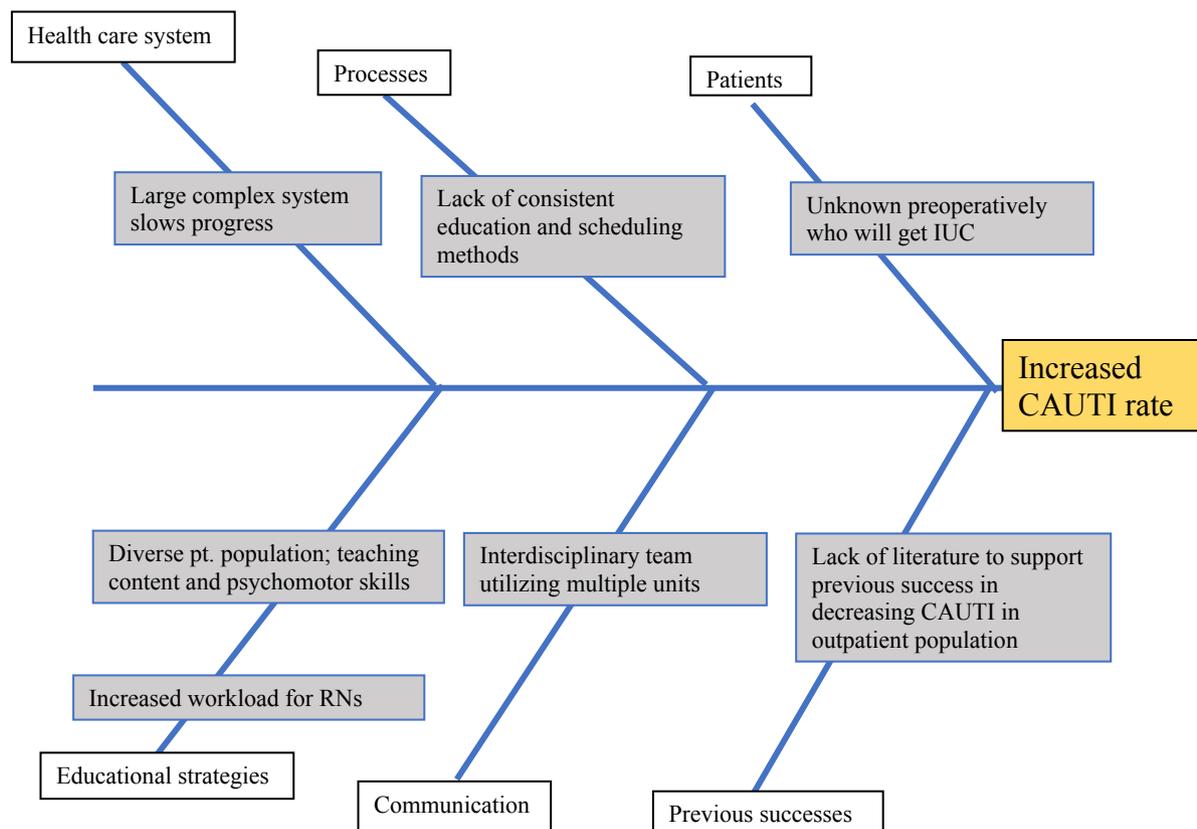


Figure 1. Fishbone diagram. CAUTI, catheter-associated urinary tract infection; IUC, indwelling urinary catheter; RN, registered nurse. This figure is available in color online at www.jopan.org.

CBT procedures, the decision for length of IUC placement was made during the surgical procedure, but only occasionally communicated to the PACU nursing staff or patient. This created confusion for the patient who was responsible for making a follow-up appointment for IUC removal. A process was created in which an “IUC Removal Form” was placed in the patient’s chart by the preoperative nurse. The IUC Removal Form was transported in the patient’s chart from the preoperative to the operative to the postoperative phases of care. The operating room nurses’ had the responsibility to ask the surgeon at the time of the surgical procedure how long the IUC was to remain in place and indicate this time on the IUC Removal Form. If no appointment for IUC removal had been previously documented in the patient’s electronic health record, the PACU

nurse or inpatient unit nurse (if the patient was staying overnight) called the Call Center to arrange an IUC removal appointment based on the IUC Removal Form information. The PACU nurse or inpatient unit nurse documented the follow-up IUC removal appointment in the patient’s discharge instructions.

Study of the Interventions

Impact of the interventions was evaluated through a checklist completed by UOC, PACU, and inpatient nurses concerning completion of the IUC care educational materials. In addition, a comment section was added to the checklist to add qualitative information about the efficiency and usefulness of the educational materials. The informal checklist was developed specifically for the

process measures related to this project. The checklist was informed by the bundle elements used in the project itself.

A monthly chart audit was completed by the QIP lead before and after the implementation of the educational program and the process for scheduling the IUC removal appointment. Monthly or individual meetings were completed with the UOC and PACU nurses and interdisciplinary team members to confirm the distribution of educational materials, evaluate the impact of the educational interventions, and discuss the efficiency of the IUC removal appointment process.

Measures

The following process measures were tracked through monthly chart audits, postoperative checklist, and meetings: (1) CAUTI diagnosis using NSQIP definition; (2) phase II PACU LOS (tracked by number of hours in phase II); (3) patient answer (yes/no) to question about receiving preoperative education; (4) documentation of preoperative IUC care education completed in the UOC for adult patients who had the potential to be discharged with an IUC after a short stay; (5) number of days IUC was in place for TURP, TURBT, and CBT; (6) number of days IUC was in place for RP; (7) number of patients who had a UOC follow-up appointment scheduled before discharge specifically stating the appointment was for removal of the IUC. Control charts were created to track data with data points added monthly.

Plan-Do-Study-Act (PDSA) cycles were completed using feedback from UOC and PACU nursing staff, patient comments, and data from chart audits. A root cause analysis diagram outlined the multiple factors that potentially contributed to CAUTI and provided the basis for many of the process changes implemented. The initial creation of an educational video and brochure outlining the care of an IUC in the home setting required multiple revisions based on the organization's Educational Committee standards for patient literacy, and feedback from nursing staff regarding patient and staff ease of use. Feedback from patients and nurses concerning initiation and sustainability of the educational program in the UOC and

PACU sparked changes in the delivery method of the educational video, and the need for an IUC Care Packet to ensure patients were given the supplies they needed for home IUC care. Using a standardized mechanism for follow-up IUC removal appointments evolved to include nurses from several phases of perioperative care.

Ethical Considerations

The QIP was vetted through an academic process that aligns with the organization's Institutional Review Board to ensure elements of quality improvement were met. Patient data were accessed through chart audits in accordance with the organization's Compliance Office. All data for the QIP were stored in a password protected computer.

Outcomes and Results

Results

The overall aim of the QIP was to reduce CAUTI in urologic oncology patients discharged with an IUC through implementation of an education program and improved scheduling processes for device removal. Sixty patients were in the group before process changes were implemented and 47 patients were in the group after process changes were implemented. The mean age was 66.16 years ($SD \pm 8.77$), with most of the patients being male (87%). Results from preintervention and postintervention data were analyzed monthly and at two-time points (December 2016 through February 2017 and December 2017 through February 2017). Monthly run chart findings were used to drive PDSA cycles to address process changes, thus building success in the project.

The CAUTI rate decreased from 12.5% to 8%, a 40% reduction. Although this finding was not statistically significant ($P = .69$) the reduction was clinically significant. Preintervention and postintervention data surrounding IUC preoperative education improved dramatically with the percentage of patients receiving preoperative education regarding IUC care increasing from 0% to 100%. LOS in the PACU was reduced 34% from 1.98 to 1.3 hours. The preintervention group LOS mean was 11.17 hours, whereas the postintervention LOS mean was 8.5 hours.

The impact on process changes to improve postoperative appointments for IUC removal was analyzed through number of days the IUC was in place, and the number of patients with scheduled device removal follow-up appointments at discharge. The number of days the IUC was in place for RP, TURP, TURBT, and CBT did not change significantly from preintervention and postintervention groups. The mean number of days for RP preintervention was 8.0 days, whereas the mean number of days postintervention was 7.88 days ($t(30) = 0.14$; $SD \pm 0.83$; $P = .89$). The mean number of days for TURP, TURBT, and CBT increased 20% between the preintervention and postintervention groups. The mean preintervention days for TURP, TURBT, and CBT was 5.43 days, and postintervention days was 6.33 ($t(8) = 0.63$; $SD \pm 1.43$; $P = .54$).

The number of patients with a follow-up appointment for IUC removal at the time of discharge was analyzed using data indicating UOC follow-up appointment specifically indicating an appointment for IUC removal. Preintervention and postintervention data for follow-up appointments specifically indicating IUC removal moved from 4% to 33%—a sevenfold increase ($P = .01$). The percentage of patients who indicated they received preoperative education regarding IUC care increased from 6.7% to 18%. A summary of the results can be found in [Table 1](#).

Discussion

Contextual elements that were important to consider with this QIP included the outpatient setting, unpredictability as to which patients would have an IUC and for how long, an immunocompromised patient population, and workflow of the UOC setting. Environmental factors included cleanliness of the home environment and an inability to monitor care of the IUC. In addition, CAUTI symptom presentation was challenged in this immunocompromised patient population. Because the duration of the IUC was individualized to the patient situation, decreasing the number of days the IUC was in place must be considered in the context of surgical site healing, surgeon preference, and potential complications. This may have contributed to the increase in the number of days the IUC was in place for TURP, TURBT, and CBT patients, whereas the number of days the

IUC was in place for RP patients remained unchanged. Individualized patient learning styles should also be considered in the context of how nurses delivered the educational materials to patients, and how patients received the information. In addition, for some urologic procedures, it was difficult to predict which patients would be discharged with an IUC until the surgical procedure was performed, providing challenges to scheduling postoperative IUC removal appointments. Adding educational materials to the preoperative packet, providing an IUC Care Packet, and reinforcing IUC care educational materials on discharge streamlined the educational process and helped to decrease the mean PACU phase II LOS.

Although contextual elements created challenges in implementing the QIP interventions, unexpected benefits were also realized. A lack of standardized protocols for IUC care created a gap in patient care. Improvements in patient education processes facilitated standardized approaches to information provided concerning IUC care establishing uniformity in clinical practice. Discussions with PACU registered nurses (RNs) revealed increased comfort with IUC discharge teaching and PACU RNs self-estimated length of time spent on discharge IUC instructions decreased to less than 30 minutes. Processes implemented in this QIP may have implications for payers focused on preventing infection and hospital readmissions while keeping costs in mind. In addition to decreasing the costs associated with a CAUTI, the decreased PACU LOS realized in this QIP equated to savings of \$11,880.00 for the organization.

PACU RNs attributed improvement in the discharge instruction process to changes in patient education provided before surgery and the creation of a standardized video patients could watch while in the PACU. Discharge efficiency was improved while keeping costs neutral through the creation of a “grab-and-go” IUC Care Packet containing IUC care supplies. Overall, positive responses were received with the implementation of a uniform approach to patient education using “hands on” materials such as a brochure and video, and improved communication about IUC duration by health care staff, UOC, and perianesthesia nurses and physicians.

Table 1. Summary: Quality Improvement Results

Measure	Preintervention	Postintervention	% Change
CAUTI rate	12.5%	8%	40% Reduction
Average preoperative education for IUC care	0%	100%	100% Increase
Average follow-up appointment for IUC removal at discharge	4%	33%	725% Increase
Average IUC insertion days: RP	8 d	7.88 d	No change
Average IUC insertion days: TURP, TURBT, CBT	5 d	6.33 d	20% Increase
Average PACU phase II length of stay	1.98 h	1.3 h	34% Reduction
Average patients who indicated they received preoperative education	6.7%	18%	168% Increase

CAUTI, catheter-associated urinary tract infection; CBT, cystoscopy with bladder biopsy or bladder tumor removal; IUC, indwelling urinary catheter; PACU, postanesthesia care unit; TURBT, transurethral resection of bladder tumor; TURP, transurethral resection of the prostate.

Difficulties with implementation of the QIP interventions were minor. The health care organization for the QIP is a large, complex health care system, thus approval for the newly created IUC educational brochure and video occurred slowly. In addition, the health care organization's brand changed during the QIP, further delaying approval and marketing of the educational materials. Costs associated with filming the video would have been prohibitive had it not been for use of a local film school who provided students and equipment for the video at no cost. Although watching the video in the preoperative UOC visit would have been ideal, the enormous amount of patient information presented in the preoperative visit made watching the video difficult and raised concerns as to the patient's ability to retain information during this preoperative visit. In addition, because the QIP team lead was not a UOC staff member and thus not familiar with the UOC workflow and patient population, stakeholder buy-in and momentum for the QIP was sometimes difficult.

Chart audits revealed very few areas of missing data for the CAUTI, PACU LOS, follow-up appointment, and device days process measures. Missing data were found for the process measure: "Did you receive instructions in caring for your catheter prior to your surgery?" Despite several PDSA cycles looking at UOC and PACU staff RNs barriers to asking this question to patients at discharge or at the follow-up appointment for IUC removal, missing data remained. We believe that staff RNs thought education of the patient regarding IUC care was more of a priority than asking the ques-

tion about preoperative IUC education, or forgot to ask the question.

Summary

CAUTIs in the outpatient population represent a small but largely unidentified subgroup of patients at risk for negative outcomes. Our QIP has shown that patient education and diligence to follow-up care reduced CAUTI incidence by 40% in patients discharged with an IUC. Although our QIP team did not reach our goal of zero CAUTIs, we were successful in improving patient outcomes and providing standardized clinical tools for efficient and consistent patient education. Strengths of the QIP included the ability to implement low-cost educational interventions with relative ease in the outpatient or inpatient clinical setting, while providing a consistent, patient-centered approach to patient education. The educational materials could be initiated in the clinical setting and later accessed at home by the patient, allowing for a "portable" method of "anytime, anywhere" education. We were also able to implement an effective method of scheduling follow-up appointments by a simple checklist.

Interpretation

To date, the QIP achieved a 40% reduction in CAUTIs. A systematic approach to patient education in the preoperative and postoperative phase of care, coupled with an effective system for scheduling a follow-up appointment for IUC removal, resulted in positive patient outcomes and standardized efficient patient care. A

multimodal educational approach to effectively decrease CAUTIs was successful in this QIP and supported by other studies.^{1-3,6,7,11} We learned that preoperative and postoperative nurses were integral and eager to engage in the delivery of IUC care patient education. Anecdotal information from patients also indicated a strong preference for video instruction as it allowed for repeated viewing of psychomotor skills necessary for IUC care. By improving workflow and decreasing the time needed for discharge teaching of patients discharged with an IUC, buy-in from the UOC and PACU staff was enhanced, allowing for collaboration when challenging contextual elements including the QIP outpatient environment, unpredictability of IUC patients, and issues related to scheduling processes occurred. Barriers to future implementation of the educational program may include the costs of the brochures and video. A streamlined scheduling process for IUC removal follow-up appointments that does not increase nurse workload would also be an important element to consider for future implementation.

Limitations

This QIP did have a few limitations. The patient population in which the process improvements were implemented was small and limited to urologic oncology patients discharged with an IUC. The lack of evidence regarding decreasing CAUTI in the outpatient population created vagueness in benchmark data when designing the QIP. Inconsistency among health care providers and the literature regarding a CAUTI definition limits the ability to generalize the QIP findings to other populations. We did not shadow a typical patient visit from preoperative to postoperative care; system processes may have been uncovered with a greater understanding of the patient's perspective and allowed for more insight into optimal timing for IUC education and scheduling a follow-up appointment. Finally, as this was a QIP, dynamics within this clinical practice setting are unique to the success of the process interventions developed to reduce CAUTIs in this patient population.

Conclusions

This QIP focused on examining the role of patient education and scheduling processes for IUC

removal to reduce CAUTIs in the outpatient urologic oncology population. Processes implemented in this QIP have implications given the focus by payers on preventing infection and hospital readmission. Nationally, the leading drivers in health care improvement such as the Institute for Healthcare Improvement have called for system-wide changes to improve patient-centered care and increase patient satisfaction.⁶ This QIP demonstrated that implementation of a consistent educational program and scheduling processes in the UOC and PACU setting improved patient outcomes while providing essential knowledge to empower patients to manage their health conditions in an outpatient setting. The sustainability of this project is contingent on making the educational materials accessible through web-based patient health care portals and continuing to refine scheduling processes for IUC removal. The QIP educational materials have the potential to be used in hospital system-wide for any patient discharged with an IUC.

Building on the positive outcomes for this QIP, more foundational knowledge and process improvements are necessary to support best practices for IUC care in the outpatient population. Outpatient clinics, health care providers, and hospital leadership need to explore and prioritize processes for patient education and follow-up care. Standardized protocols for IUC removal in specific urologic surgical procedures need to be created to enhance preoperative scheduling of IUC removal. A consistent definition of CAUTI would also be a useful area for future study to provide consistency in reporting CAUTI.

Although much attention has been focused on reducing CAUTI in the inpatient population, there is currently a dearth of evidence-based interventions and processes shown to reduce CAUTI in the *outpatient* setting. This QIP improved patient education and postoperative follow-up processes to ultimately decrease CAUTI by 40%. In addition, the decreased PACU LOS equated to a cost savings of \$11,880.00 for the organization. Decreasing CAUTI in the outpatient setting will most certainly be a topic of discussion in the current health care system driven by cost-containment and patient satisfaction, making this project a compelling example of innovation worthy of implementation.

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