

# Decreasing the Incidence of Postoperative Urinary Retention and Incontinence With Total Joint Replacement Patients After Spinal Anesthesia in the Postanesthesia Care Unit: A Quality Improvement Project

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**Purpose:** *Patients with postoperative urinary retention (POUR) can develop bladder atrophy, urinary incontinence, and hypertension. The purpose of this quality improvement project was to implement standardized guidelines for bladder scanning for patients who have total knee or hip replacement to decrease POUR and incontinent episodes.*

**Design:** *A retrospective descriptive study was implemented in a 425-bed Magnet community hospital.*

**Methods:** *Patients were bladder scanned within the first hour of postanesthesia care unit admission. Straight catheterization was performed for those who had more than 400 mL of retained urine. The protocol included both total knee and total hip replacement surgeries with spinal anesthesia. Compliance with scanning, percentages with POUR, and incontinent episodes were reviewed.*

**Findings:** *POUR was detected in 46% of total knee replacement patients and 36% of total hip replacement patients. Incontinence rates for knee replacement patients decreased by 14% and by 2% for patients with total hip replacements.*

**Conclusions:** *A bladder scanning protocol decreases postoperative incontinence. Bladder scanning also helps to decrease POUR by decreasing the potential risk of complications.*

**Keywords:** *hip replacement, knee replacement, urinary retention, bladder scanning, protocol.*

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**POSTOPERATIVE URINARY RETENTION** (POUR) is a condition that can lead to bladder atrophy, urinary incontinence, hypertension, and

urinary tract infections.<sup>1</sup> Incontinence can occur as a result of spinal anesthesia. POUR can increase the risk of incontinence with total joint replacement patients receiving spinal anesthesia. For this study, POUR was defined as a bladder volume of greater than 400 mL. Prevention of urinary incontinence in the postanesthesia care unit (PACU) has the potential to decrease the length of stay and infection rates.<sup>2</sup> The trend in orthopaedic surgery is to avoid the use of indwelling catheters for total joint replacement surgeries. This increases the possibility of incontinence and bladder distention.

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## Problem

Patients who have a total knee or total hip replacement arrive in the PACU unable to feel their legs or bladder fullness because of spinal anesthesia. After several hours of PACU time and receiving intravenous fluids, they are unable to void. When patients are transferred to the inpatient department, their bladders may be distended (greater than 500 mL) as detected by bladder scanner. The inpatient nurse may need to perform straight catheterization of these patients to avoid incontinence and a urine-saturated surgical dressing. Patients may also be embarrassed at being incontinent.

Bladder scanning was done randomly with only 13% of all patients being scanned by the PACU staff. In our PACU the incontinence rate before the protocol was 14% (n = 10) in total knee replacement patients with spinal anesthesia during a 3-month prestudy review. If the dressing became saturated from incontinence, the physician assistant or surgeon would then need to come to the PACU to change the dressing the first time. This same issue was also occurring in the total hip replacement patients as surgeons began to reduce the use of the indwelling catheters during surgery. The incontinence rate before the protocol was 6% (n = 5) in total hip replacement patients with spinal anesthesia. Bladder scanning was completed in 41% (n = 33) of the total hip replacement patients and these patients showed signs of POUR, which was defined as volumes greater than 400 mL of urine. Data were based on a retrospective chart audit. No medical history was taken into consideration during the audits. The patients who had spinal anesthesia and no indwelling urethral catheter were found to have incontinence.

## Literature Review

A literature review was completed to support the study. The *Journal of Arthroplasty* defines POUR as the inability to void in the presence of a full bladder, which in an adult is between 400 and 600 mL.<sup>2</sup> To improve the management of POUR, intermittent or continuous indwelling urethral catheters are used. Straight catheterization is associated with lower costs, shorter length of stays, and an earlier return of bladder function. The study looked at 180 patients who underwent

a total hip arthroplasty.<sup>2</sup> Seventy-six patients developed POUR, 42 had a single straight catheterization in the PACU, and then 20 required an additional straight catheterization in the inpatient unit. This article supports the present study where patients who received high volumes of intravenous fluids are at higher risk for developing POUR after total hip arthroplasty under spinal anesthesia.

The literature reports that patients who develop POUR had an increase in risk factors and increased length of stay. A 2011 study<sup>3</sup> in Montreal assessed knee and hip arthroplasty surgeries. The report evaluated a need for a protocol to establish the incidence of POUR and the need for bladder scanning. Two hundred eighty-six patients met criteria for this study and 73 of them were placed in the POUR group, who received straight catheterization. Eighteen of the 73 patients needed straight catheterization one time whereas six of them needed it twice. The other 49 patients had an indwelling catheter placed because of multiple straight catheterizations for 48 hours postoperatively as per the hospitals' protocol. Seventeen percent of the two hundred eighty-six patients had developed persistent urinary retention that required an indwelling catheter. The findings in this study show that ultrasound-guided bladder volume assessment could help decrease or avoid the use of catheterization, decrease length of stay, and decrease the risk of developing a urinary tract infection.

Feliciano et al<sup>4</sup> studied PACU patients to determine the incidence of POUR, characteristics of patients who developed POUR, and how it affected the length of stay. The study took place from December 2005 through June 2007 in a 24-bed PACU that cares for approximately 64 patients daily. POUR was defined as bladder volumes between 250 and 500 mL. Forty-four percent of patients (n = 90) were identified as having POUR. Patients with POUR stayed in the PACU longer than those without (262 vs 236 minutes). The extra time spent in the PACU can greatly impact the flow of the department. The concerns of the PACU nurses in this study were like the concerns of the PACU nurses in our project with the patient's arrival to the PACU with bladder distention.

Kort et al<sup>5</sup> developed a nurse-driven bladder scanning protocol after total hip and total knee replacement surgeries. Bladder volumes were assessed, and retention was defined as bladder volumes greater than 600 mL. Eight hundred three patients were in this study and were bladder scanned intermittently throughout the preoperative and postoperative period and a repeat bladder scan was done every 3 hours in the orthopaedic inpatient unit. With the use of the nurse-led bladder scanning protocol there was a low incidence of POUR after hip and knee arthroplasty when compared with the literature.

Recommendations for practice from the literature include assessment of patients for urinary retention on admission to the PACU and that bladder scanning is a preferable method of assessment. Bladder scanning is a safe and accurate way to assess the patient and intervene when appropriate. With the use of bladder scanning, detection of urinary retention is possible and treatable.

### **Purpose**

The purpose of this quality improvement project was to implement standardized guidelines for bladder scanning for patients who have total knee or hip replacement under spinal anesthesia to decrease POUR and incontinence episodes. The practice change was implemented in two phases: knee replacement year 1 (study Phase I), followed by hip replacement year 2 (study Phase II). Goals of the project were to decrease POUR and increase incontinence in both study groups by creating a bladder scanning protocol.

### **Design**

A retrospective, descriptive study was undertaken in a Magnet designated 425-bed community hospital with 21 operating rooms and 36 PACU beds. The hospital performs approximately 500 total knee replacements and 300 total hip replacement surgeries per year with greater than 80% of them receiving spinal anesthesia.

## **Methods**

### ***Total Knee Replacement: Study Phase I***

The criteria for inclusion in this study were patients with total knee replacement, spinal anesthesia, and no indwelling urethral catheter. During March 2016, education was provided to the staff by the nurse clinician on the importance of bladder scanning. All registered nurses and patient care technicians (PCTs) demonstrated proper use of the equipment. Education was provided through one to one discussion, e-mails, power points, and journal articles for more than 1 month. The bedside nurses performed a bladder scan on the total knee replacement patient on arrival to the PACU (or within 1 hour). The PCT was also able to perform this task. If the bladder contents were greater than 400 mL and the spinal was higher than an S1 dermatome, a straight catheterization was performed as ordered by the physician as part of the total joint replacement order set. If the bladder volume was less than 400 mL, or if the spinal had worn off, the nurse monitored the patient and re-scanned the patient if there was no spontaneous void in the PACU. The patient was encouraged by the PACU nurse to void with the use of the bedpan when in the PACU if possible.

If it was after 7 p.m. and the patient still could not void, the nurse was instructed to bladder scan again and perform straight catheterization if bladder volume was greater than 400 mL. At 7 p.m. the physical therapist left for the day in the inpatient unit, and the patient was then unable to get out of bed until the following day.

A number of patients who met criteria for Phase I of the study were recorded 3 months before the change ( $n = 70$ ). The patients who were scanned were recorded as well as the number of incontinent episodes. A number of patients who met criteria were looked at for the first 3 months after implementation ( $n = 65$ ), 6 months ( $n = 30$ ), 9 months ( $n = 26$ ), and 12 months ( $n = 36$ ) for sustainability. RN compliance was documented if the patient was scanned within the first hour of PACU time and if they had performed straight catheterization, or if the patient had an incontinent episode. Failure to effectively implement the

protocol resulted in disqualification of the episode for this study.

### ***Total Hip Replacement: Study Phase II***

The criteria for inclusion in this phase were patients who had a total hip replacement, spinal anesthesia, and no indwelling urethral catheter. Education was provided to staff in March 2017 by the clinician to include this patient population for bladder scanning. Reinforcement with study Phase I teaching was completed with the nurses and PCTs. If the bladder volume was greater than 400 mL and the spinal was higher than an S1, then straight catheterization was performed as ordered by the physician as part of the total joint replacement order set.

For study Phase II, 5 months of data before the implementation were collected. All documentation was the same for both the total knee and total hip replacement patients. Education was provided in a similar way as a refresher to nurses and PCTs. A number of patients who met criteria were looked at for the first 3 months after implementation (n = 50), 6 months (n = 15), 9 months (n = 1), and 12 months (n = 5) for sustainability.

### ***Data Collection***

Compliance was measured for bladder scanning and the incontinence frequency in the PACU as well as the first 4 hours in the inpatient setting. These data were collected by retrospective chart audits and through the electronic health record.

The following data were collected at these checks:

- The percentage of patients who met criteria.
- The percentage of patients who were bladder scanned within the first hour of PACU arrival.
- The percentage of patients who needed straight catheterization.
- The percentage of patients who were incontinent in the PACU or within the first 4 hours in the inpatient floor (study Phase II).

This project was approved by the University of Pittsburgh Medical Center Quality Improvement Board as a quality improvement project. All data were collected and kept secure and private in accordance with Healthcare Information Privacy and Portability Act regulations.

## **Findings**

Descriptive statistics were used to calculate the percentages of patients who developed POUR and those requiring straight catheterization and incontinence episodes.

### ***Total Knee Replacement: Study Phase I***

Within the study setting, over 500 total knee replacement surgeries are done each year, with more than 400 of them having spinal anesthesia. Three months of patient records were retrospectively reviewed before project implementation (December 2015 to February 2016). Before the intervention, only 13% of patients were bladder scanned in the PACU (n = 70). Fourteen percent of these patients were incontinent in the PACU. Eleven percent showed signs of POUR and required straight catheterization.

At 3 months, 65 patients met inclusion criteria for the 3 months following project implementation (April 2016 to June 2016). Sixty-nine percent of these patients were scanned within the first hour (n = 45), 36% required catheterization (n = 16), and 3% were incontinent (n = 2).

At 6 months (September 2016), 30 patients met criteria. Eighty-three percent of them were scanned within the first hour (n = 25), 52% of those required catheterization (n = 13), and there were no episodes of incontinence.

At 9 months (December 2016), 26 patients met criteria. Eighty-one percent were scanned (n = 21) within the first hour, 57% of those required catheterization (n = 12), and there were no episodes of incontinence.

At 12 months (March 2017), 36 patients met criteria. Eighty-nine percent were scanned (n = 32) within the first hour, 47% of those required straight catheterization (n = 15), and there were no episodes of incontinence (Figure 1).

### ***Total Hip Replacement: Study Phase II***

Almost 300 total hip replacement surgeries were performed in 2016 with 250 of them received spinal anesthesia. Five months of predata were obtained before the change (September 2016 to

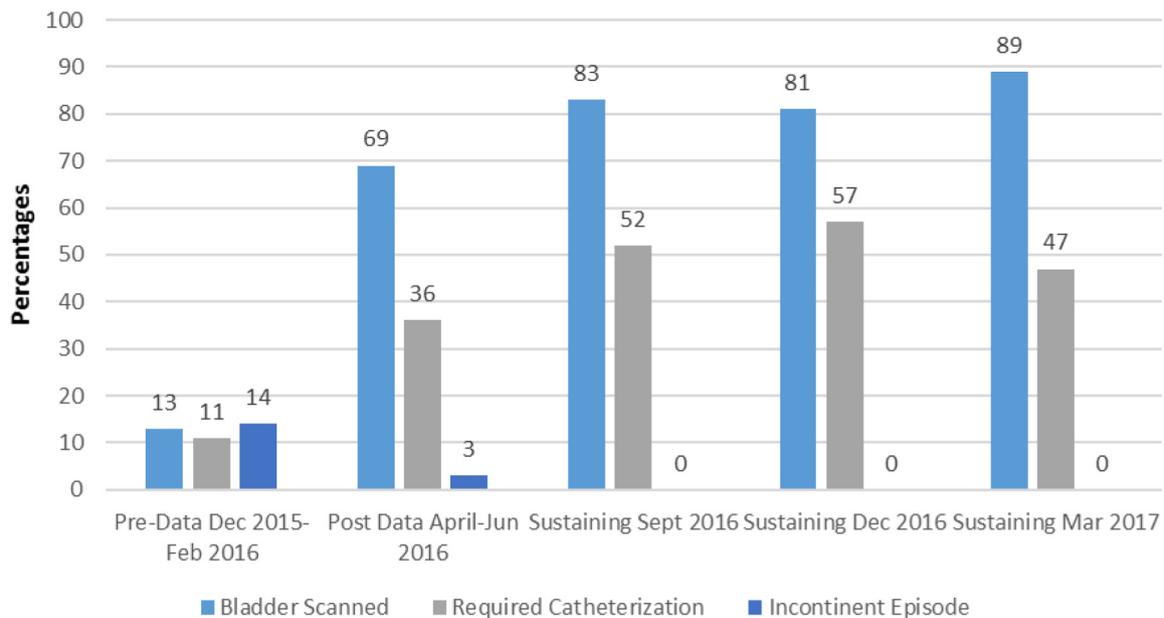


Figure 1. Preresults and postresults of bladder scanning in total knee replacement patients. This figure is available in color online at [www.jopan.org](http://www.jopan.org)

January 2017). Before the intervention, 42% ( $n = 34$ ) of eighty-one patients who met criteria were scanned. Of those patients 24% showed signs of POUR and required straight catheterization ( $n = 8$ ) and 6% of those scanned were incontinent in the PACU/4 h postoperation on the inpatient floor ( $n = 5$ ).

At 3 months, 50 patients met inclusion criteria (April 2017 to June 2017). Ninety-four percent were scanned within the first hour ( $n = 47$ ), 38% of those required straight catheterization ( $n = 18$ ), and 2% of those were incontinent ( $n = 1$ ).

At 6 months (September 2017), 15 patients met criteria. One hundred percent were scanned within the first hour, 20% of those required catheterization ( $n = 3$ ), and there was one incontinent episode.

At 9 months (December 2017), one patient met criteria. This one patient was then bladder scanned and required straight catheterization.

At 12 months (March 2018), five patients met criteria. Eighty percent ( $n = 4$ ) were scanned within the first hour, 50% of these patients

scanned required straight catheterization ( $n = 2$ ), and there was one incontinence reported (Figure 2).

## Discussion

The literature indicates that by instituting a protocol (Table 1), early detection of POUR is possible. Detection of POUR provides physiological and psychological benefits to the patient. Comparing this to the present study showed an increase in bladder scanning, a decrease in patient incontinence, and a decrease in POUR. Bladders that reach more than 400 mL should have straight catheterization performed as evidenced by the literature. Patients who have hip and knee surgeries under spinal anesthesia are proven to have an increased risk of POUR.

The results showed that with a protocol in place for bladder scanning, incontinence rates were very low, and in some instances eliminated. The compliance of bladder scanning has increased among the PACU staff. An increase in education after change showed that at 9 months, the change was sustained, and the culture of the unit had changed. By decreasing incontinence rates, it likely led to patient satisfaction.

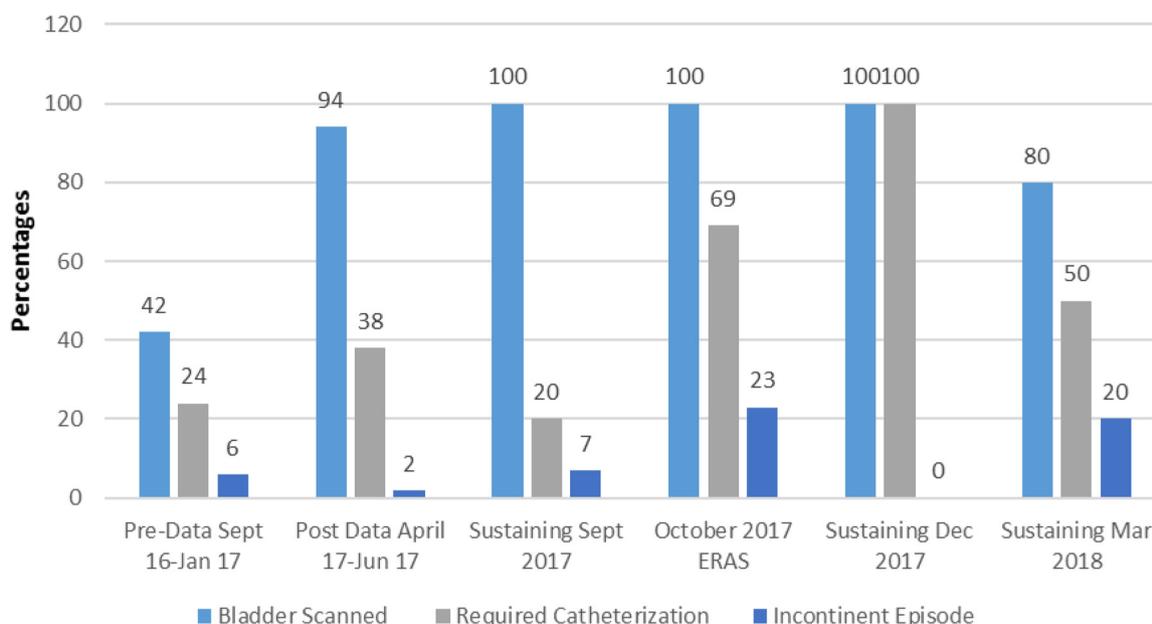


Figure 2. Preresults and postresults of bladder scanning in total hip replacement patients. This figure is available in color online at [www.jopan.org](http://www.jopan.org).

In Phase II of the study, the number of patients who met criteria decreased at the 9-month audit. This decrease was a result of the implementation of the enhanced-recovery after surgery (ERAS) with the total joint population. This program increased the usage of intravenous fluids (1,000 mL/h intraoperatively and 200 mL/h in the PACU) and led to many surgeons returning to the practice of indwelling urethral catheters, to be removed on postoperative day 1 at 6 a.m. This affected both the total knee and total hip replace-

ment patient population. Data were collected in October 2017 for the total hip replacement patient population when ERAS began. At that time, only 13 patients met criteria, nine of them had straight catheterization performed and there were three incontinent episodes. However, 17 patients had indwelling catheters from the operating room to the PACU. Not all the surgeons use indwelling urethral catheters, and as a result, the December sample size was significantly smaller.

#### Table 1. Protocol for Bladder Scanning

- Bedside nurse or PCT completes bladder scan within 1 h of arrival to the PACU
- If the bladder has less than 400 mL of urine, monitor for distension and rescan as needed in the PACU or before transfer to inpatient unit if no spontaneous void in the PACU
- If the bladder has greater than 400 mL of urine and the spinal was still higher than an S1, perform straight catheterization as ordered by the physician
- After 7 p.m. if the patient still has not voided, perform a bladder scan. If urine amount is greater than 400 mL encourage use of bedpan if possible, or perform straight catheterization as ordered by the physician

PACU, postanesthesia care unit; PCT, patient care technician.

#### Implications

The present findings compare favorably with the literature. This may suggest that bladder scanning is necessary in detecting POUR, by becoming more aware of increased volumes in patient's bladders who may require straight catheterization. If a patient's bladder is scanned for less than 400 mL of urine, then continued monitoring is done in the PACU alongside of spinal anesthesia assessment. This ultimately decreases incontinence as patient's risk of POUR is detected early and treated before an incontinent episode. It provides the patient with dignity and respect when recovering from surgery. The patient is at less risk for skin breakdown leading to infection in addition to preventing the possibility of infection at the surgical site.

Work was done with the informatics team along with physician's approval on the use of the order in the total joint replacement power plan. This order remains active on their order set when transferred out of the PACU to the inpatient unit.

### **Limitations**

This evidence-based quality improvement project was completed in one unit in a community hospital and may not be applicable to all hospital settings. The practice change was implemented in two phases, one for total knee replacements and the other for total hip replacements. Data were collected for each population for 1 year. With the implementation of ERAS in October 2017, the total hip replacement audit included many more incontinent episodes because of the increase in the intraoperative intravenous fluid and PACU fluid requirements, causing the surgeons to use indwelling catheters. For this reason, the number of eligible patients who had no indwelling catheter with total hip replacements was low after the start of ERAS.

Catheter-associated urinary tract infection data and surgical site infection rates were not a part of this study, but could be looked at in a future study. The impact on bladder scanning in relation

to these is unclear. Additional studies could also investigate patients past medical history and provide any correlation between that and their incontinent episodes.

### **Conclusions**

Bladder scanning in patients has been shown to be a highly useful, easily instituted, and effective way to decrease complications after a total knee replacement. Given the data, at the 9-month audit the protocol was sustained among staff. The success of the study Phase I prompted the extension of the protocol to include total hip replacement patients (study Phase II). With the completion of the second phase, bladder scanning has become a part of the culture of the PACU staff and is now a standard order set in the electronic health record for the total joint replacement patients from the physicians.

### **Acknowledgments**

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