

# Reducing catheter-associated urinary tract infections using a multimodal approach — the NSQIP experience of Oakville Trafalgar Memorial Hospital

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## SUMMARY

Catheter-associated urinary tract infections (CAUTI) cause significant morbidity and mortality in the surgical population as well as significant costs to health care. It can be surprisingly difficult to address this common complication without a multifaceted, multimodal team-based approach to the problem. We used our National Surgical Quality Improvement Program (NSQIP) data on the incidence of CAUTI in our “procedure targeted” and “essentials” general surgery and orthopedic surgery cases before and after the implementation of our reduction strategy and found a significant improvement. This article discusses our multimodal approach to CAUTI.

Catheter-associated urinary tract infections (CAUTI) are a clinically important complication after surgical procedures and represent the fourth most common (12.9%) hospital-acquired infection.<sup>1</sup> These complications are related to catheter use 80% of the time, and to reduce CAUTI requires a multimodal approach in many different departments of the hospital to achieve sustainable results.<sup>2</sup> It can be surprisingly difficult to address this common complication without a multifaceted, multimodal team-based approach to the problem.

Oakville Trafalgar Memorial Hospital is a 469-bed facility in Oakville, Ont., that in 2016 performed 13 401 surgical procedures. In October 2015, after reviewing our National Surgical Quality Improvement Program (NSQIP) CAUTI results, a quality-improvement team was created and used to implement a wide variety of changes over the following 15 months.

We used the “procedure targeted” and “essentials” options of our NSQIP database, collecting 1680 cases per year from general surgery (colectomy, ventral hernia, appendectomy) and orthopedic surgery (total knee arthroplasty, total hip arthroplasty, hip fracture surgery). The essentials option allowed us to collect data from a variety of procedures in specified specialties, while the procedure targeted option allowed us to focus on specific common cases out of a list of more than 30 specific procedures felt to be clinically important or subject to a high morbidity and mortality. For our before and after study, data were collected for the first six months of the program with no intervention while developing the implementation bundle described below. After implementing the bundle over 15 months, data collection continued from January to June 2017.

## OUR APPROACH

We created a Surgical Quality Improvement Team (SQUINT) comprising our surgical clinical reviewer; surgeon champion (a general surgeon);

division head of orthopaedics; division head of urology; anesthesiologist; surgical assistant; professional practice nursing clinicians from the operating room (OR) and surgical floors; nursing managers from the post-anesthesia care unit, day surgery, OR and surgical floors; nursing quality lead; our acute pain team; physiotherapist; and the program director of surgery.

We created plan-do-study-act (PDSA) cycles and sequentially introduced the changes determined to be the most beneficial based on our literature review and discussions with other NSQIP sites.

Our approach was modelled after the Johns Hopkins Comprehensive Unit-Based Safety Program (CUSP) model. Monthly meetings allowed a review of all instances of CAUTI and an assessment of change ideas. Our approach to CAUTI reduction was divided into four components:

- reduction of routine catheter placement and auditing placement,
- aseptic catheter placement when needed and a closed drainage system,
- appropriate maintenance of catheters when in place, and
- earliest possible catheter removal with appropriate catheter removal protocols.

**Reducing catheter placement**

With the significant shift in colonic resections to a laparoscopic approach, the use of epidural catheters and urinary catheters has dropped significantly. Historically, in the orthopedic joint replacement population catheter placement in the OR had been a routine practice. The use of regional anesthesia and multimodal pain control has improved patient mobility and reduced catheter usage. An educational campaign was instituted among all surgical specialties to minimize and attempt to eliminate the routine placement of urinary catheters in favour of catheter placement only for appropriate indications and considering alternatives (Appendix 1, available at [canjsurg.ca/017217-a1](http://canjsurg.ca/017217-a1)).

**Aseptic catheter placement**

An education campaign was introduced to all caregivers (both new and experienced) responsible for urinary catheter placement to reinforce the best practices. Checklists were developed for catheter insertion (Appendix 1). In addition to including printed media on catheter placement carts, we created handy pocket cards with a quick summary of optimal catheter placement protocols.

**Appropriate maintenance of catheters**

When catheters are in place, appropriate non-tension securing should be applied. A daily bathing protocol and

meatal cleaning should also be performed. In addition, catheter collection bags should not be placed on the ground, and during patient transport, collection bags should not be placed higher than the patient, which results in urinary reflux. Finally, proper hand hygiene must be performed, and patients and family need to understand proper use and maintenance (Appendix 1).

**Earliest possible catheter removal**

On the surgical floors, all patients with urinary catheters are monitored daily; the routine question is whether the catheter can come out today. Our McKesson computer monitoring system allows the easy identification of all patients who currently have catheters in situ. A nursing medical directive had been developed that allows nursing staff to determine whether catheters can be removed, and we improved awareness of this directive (Appendix 1). After catheters are removed, we follow a post-catheter removal voiding protocol involving prophylactic use of the bladder scanner to determine whether in and out catheterization is required before bladder overdistension (Appendix 1). In and out catheterization is used instead of an indwelling catheter for issues of retention.

**OUTCOME**

In the preintervention six-month period of April to September 2015, our overall CAUTI rate was 2.4% (20 of 828 cases). After introducing our multimodal approach, the CAUTI rate from January to June 2017 dropped to 0.7% (6 of 887 cases,  $p = 0.003$ ). Table 1 shows how routine catheter use dropped significantly in our joint replacement population.

We believe the reduction in routine catheter placement in the OR was the primary change that reduced our CAUTI rate. The duration of catheter use most strongly correlates with CAUTI risk, and some studies have reported that up to 50% of catheters are unnecessary.<sup>2</sup> Catheters are not required for most general surgical procedures, even those done with neuroaxial blocks. Using goal-directed fluid therapy, intravenous fluid use can be reduced, resulting in less postoperative diuresis. With a modern approach to catheter placement indications and an understanding that only a minority of patients with neuroaxial blocks require indwelling catheters, routine use can be

**Table 1. Routine catheter placement in the operating room in patients undergoing joint replacement**

Surgical procedure	Prebundle, no. (%) <sup>*</sup>	Postbundle, no. (%) <sup>†</sup>	p value
Total hip arthroplasty	23/140 (16%)	8/197 (4%)	0.001
Total knee arthroplasty	16/191 (8%)	3/234 (1.2%)	0.001

<sup>\*</sup>April to September 2015.  
<sup>†</sup>January to June 2017.

reduced substantially.<sup>3</sup> Our use of in and out catheterization has increased with our significant reduction in routine indwelling catheter use. That does require the provision of adequate support in terms of equipment and nursing staff.

Our division heads of orthopaedics and urology were invaluable in getting buy-in from their divisions to stop the routine use of urinary catheters; getting support from the trusted leader was the key to make the change sustainable. Challenges included nursing education; teaching all stakeholders, including porter staff; and emphasizing the importance of sustaining the early wins we had achieved.

## CONCLUSION

Reducing the routine use of urinary catheters, appropriate maintenance, and earliest possible removal appears to be an effective strategy to address the clinically important issue of CAUTIs. A comprehensive team-based approach has the potential to produce long-acting results.<sup>4</sup> An evidence-based approach that addresses the patient's full experience of care can lead to sustained reduction of this significant complication.<sup>5</sup> Promising new, long-acting, non-narcotic pain methods may reduce postoperative issues with urinary retention and catheter use.

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