

PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

- Introduction
- Definitions
- Risk Factors for CAUTI
- Recommendations (SPS / CDC)
 - Aseptic Insertion of Urinary Catheters
 - Proper Urinary Catheter Maintenance
 - Urine Culture Stewardship
- Quality Improvement Initiatives to Aid in Reduction of In-Dwelling Catheter Days
 - Written clinical indications
 - Nurse led removal protocols and algorithms
 - Protocols for failure to void situations to prevent needless catheterizations
- Insertion Bundle
- Maintenance Bundle
- Nurse Driven Algorithm
- Appendix A
- Appendix B
- References

INTRODUCTION

Urinary tract infections are the most common type of healthcare-associated infection, accounting for almost 40% of infections reported by acute care hospitals.¹ Up to 25% of hospitalized patients have short term indwelling catheters and in many cases they are placed for inappropriate indications, and healthcare providers are unaware that their patients still have catheters in place.¹ 70% to 95% of UTIs that develop in hospitals are precipitated by use of indwelling catheters.² Morbidity and mortality from CAUTI is low compared to other hospital acquired infections, but the high prevalence of urinary catheter use leads to a large cumulative burden with resulting infections and death.¹

The Children's Hospitals' Solutions for Patient Safety National Children's Network (SPS), is a collaborative effort to eliminate serious harm across all children's hospitals. Through quality improvement methods, they have focused on reducing harm by implementing bundles to reduced ten identified Hospital Acquired Conditions (HACs). This has been effective in that HACs have been reduced by 40%.³ In fact, since 2012, it has led to an estimated savings of more than \$148.5 million and saved 9093 children from serious harm, with a consistent upward trend in harm prevented every month (as of June 2017).³

Catheter-associated urinary tract infection (CAUTI), is the 6th largest contributor to harm caused across the SPS network.⁴ In 2012, the SPS recommended CAUTI prevention bundle was released and has shown a 25% CAUTI reduction as of 2014. The SPS bundle elements, based on level of evidence, are aimed at assisting hospitals in prioritizing their efforts for designing and implementing evidence based bundles. They consist of;

- **Standard Elements:** strong evidence suggests that implementation of this element is associated with significant decrease in patient harm; all SPS hospitals should implement and measure reliability of this element.
- **Recommended Elements:** Preliminary data and clinical expert opinion support the implementation of this element; SPS hospitals should strongly consider implementing this element.

DEFINITIONS

Catheter-associated UTI (CAUTI):

A UTI where an indwelling urinary catheter was in place for >2 calendar days on the date of event, with day of device placement being Day 1, **AND** an indwelling urinary catheter was in place on the date of event or the day before. If an indwelling urinary catheter was in place for >2 calendar days and then removed, the date of event for the UTI must be the day of discontinuation or the next day for the UTI to be catheter-associated.⁵

Symptomatic UTI / CAUTI:

- Patient had an indwelling urinary catheter that had been in place for >2 days on the date of event (day of device placement = Day 1) **AND** was either:
 - Present for any portion of the calendar day on the date of event
 - OR**
 - Removed the day before the event
- Patient has at least one of the following signs or symptoms:
 - Fever (>38.0°C)
 - Suprapubic tenderness (with no other recognized cause)
 - Urinary urgency (can't be used when catheter in place)
 - Urinary frequency (can't be used when catheter in place)
 - Dysuria (can't be used when catheter in place)
- Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of ≥10 CFU/ml.

Symptomatic UTI / CAUTI If Patient is Less Than 1 Year of Age:

- Patient has at least one of the following signs or symptoms:
 - Fever (>38.0°C)
 - Hypothermia (<36.0°C)
 - Apnea*
 - Bradycardia*
 - Lethargy*
 - Vomiting*
 - Suprapubic tenderness*
- *No other recognized cause

Asymptomatic Bacteremic Urinary Tract Infection (ABUTI):

Patient must meet all of the following:

- Patient with* or without an indwelling urinary catheter has no signs or symptoms of SUTI
- Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of ≥100,000 CFU/ml
- Patient has organism identified from blood specimen with at least one matching bacterium to the bacterium identified in the urine specimen

RISK FACTORS FOR CAUTI

Presence of a urinary catheter is the strongest risk factor for bacteriuria and is associated with a 3% to 10% risk of developing bacteriuria per day of catheterization.² The prevalence of bacteriuria increases with continued catheter use, from 26% after 2 to 10 days, and 100% at 30 days.² The risk of developing a CAUTI is directly associated with longer duration of indwelling catheter placement,⁶ therefore limiting placement of indwelling catheters and the duration of placement to shortest justifiable time, is the most effective way to reduce the incidence.⁶ Low quality evidence suggests that female sex, older age, prolonged catheterization, impaired immunity and lack of antimicrobial exposure are also risk factors.¹

RECOMMENDATIONS (SPS / CDC)^{1 4}

Aseptic Insertion of Urinary Catheters:^{1 4 7}

- Avoid unnecessary catheterization
 - Insert catheters only for appropriate indications (See [Appendix A](#))
 - Minimize duration of use
 - Consider alternatives for bladder management (See [Appendix B](#))
- Use aseptic technique for catheter insertion
 - Perform hand hygiene immediately before and after insertion or manipulation of the catheter device or site
 - Use sterile gloves, drape, sponges and appropriate antiseptic or sterile solution for periurethral cleaning, and a single packet of lubricant jelly for insertion.
 - Secure catheter after insertion to prevent movement and urethral traction

Proper Urinary Catheter Maintenance:

- Maintain closed drainage system
 - If breaks in aseptic technique, disconnection or leakage occur, replace the catheter and collecting system using aseptic technique and sterile equipment.
- Maintain hygiene
 - Perform perineal hygiene at minimum daily (with soap/water)
- Keep bag below level of bladder
 - Keep the collecting bag below the level of the bladder at all times. Do not rest bag on the floor
- Maintain unobstructed flow of urine
 - Keep catheter and collecting tube free from kinking
 - No need to change catheters or drainage bags at routine, fixed intervals. Only change if clinical indications, such as infection, obstruction or when the closed system is compromised
- Daily assessment of the need for continued catheterization
 - Remove catheter when no longer needed. If physician order in place on SCM to follow “nurse driven protocol”, then daily assessment and removal as soon as criteria met.

Urine Culture Stewardship:

American college of critical care medicine and the infectious diseases society of America recommend utilizing urine cultures when evaluating fever in the critically ill only when patient is at high risk of invasive infections due to the high rate of asymptomatic bacteriuria.² Some appropriate urine culture situations are: part of evaluation of sepsis without a clear source, based on local findings suggestive of CAUTI (pelvic discomfort/flank pain)⁸ with the avoidance of sending urine cultures based on: urine quality, screening purposes, “PAN” culturing without mindfulness in evaluating source and repeating cultures to document clearance (no clinical benefit to patients).

QUALITY IMPROVEMENT INITIATIVES TO AID IN REDUCTION OF IN-DWELLING CATHETER DAYS

Most initiatives focus on appropriate use of catheters (decrease in utilization) and early removal strategies, as well as improvements in urinary catheter aseptic insertion technique and maintenance practices, as an effective way to decrease incidence of CAUTI.

- **Written Clinical Indications** (See [Appendix A](#))
 - Urinary catheters are utilized in 12% to 25% hospitalized patients, with recent studies showing that nearly 50% of surgical patients keep their catheters for longer than 48 hours after surgery and nearly 50% of medical patients with catheters, have no clear indications for ongoing catheterization.⁹ Some of the reasons for prolonged/unnecessary catheterizations are related to convenience, misunderstanding of necessity/ appropriateness and lack of clear orders for removal.⁹ See [Appendix A](#) for list of clinical indications.

- **Nurse Driven Protocol / Algorithm**
 - Ordering of insertion and removal of indwelling catheters is traditionally a physician order. Several studies now show, however, that physicians not only tend to keep indwelling catheters in place without appropriate indications, but in many cases, they may not even be aware of that the patient has an indwelling catheter.² Having the nurse, who is caring for the patient and the device assess the daily need for the indwelling catheter following an algorithm allows this responsibility/task may be appropriately removed from the physician.² With written and approved lists of clinical indications, nursing staff can assess patient's daily need for catheterization, and remove catheters when they no longer meet criteria. These protocols have been tested in many studies with good success at significantly decreasing total catheter days, catheter utilization rates and CAUTI rates,² when combined with a bundled approach. If a physician/NP has ordered the foley insertion and checked off the box to follow nurse driven protocol in SCM, then this protocol will be followed by the RN with daily assessment of need and removal if criteria no longer met to keep foley in. This will be done without an official doctor's order to remove catheter.

- **Protocols for Failure to Void Situations:**^{1 10 11}

Purpose is to avoid urinary retention and bladder distension, by assessing bladder volumes and performing regular intermittent catheterizations until return of voiding. These studies produced low quality evidence and did not show a difference in rates of bacteriuria with intermittent vs. indwelling catheterization, but ensures length of catheterization is decreased, which is shown to improve risk of developing CAUTI.¹

 - Use of bladder ultrasound scanners: low quality evidence to suggest a benefit in using ultrasound to assess urine volumes in patients undergoing intermittent catheterization. The benefit is in reducing catheterizations, rather than risk of UTI.
 - Nurse Directed use of intermittent catheterization.
 - Refer to "Assessment of / Protocol for Failure to Void" in [Appendix B](#).¹⁰

INSERTION BUNDLE

Prevention Bundle Element- Insertion	Care Descriptions
Use Aseptic Technique for Insertion	<ul style="list-style-type: none"> ▪ Perform hand hygiene immediately before and after insertion or any manipulation of the catheter device or site ▪ Use sterile gloves, drape, sponges and appropriate antiseptic or sterile solution for peri urethral cleaning, and a single packet of lubricant jelly for insertion

Avoid unnecessary catheterization	<ul style="list-style-type: none"> Make sure patient meets criteria for foley catheter use Follow Nurse-driven algorithm to assess daily appropriateness of continued catheter usage Discontinue when criteria no longer met, if SCM order in place to follow nurse-driven algorithm
-----------------------------------	---

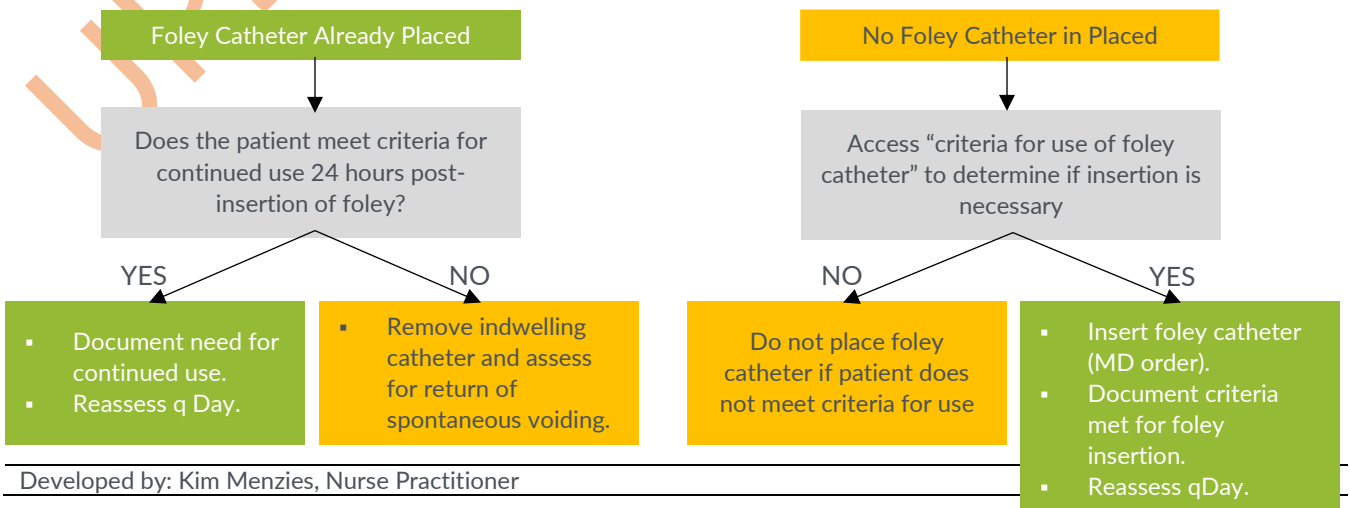
*SPS / CDC Reference

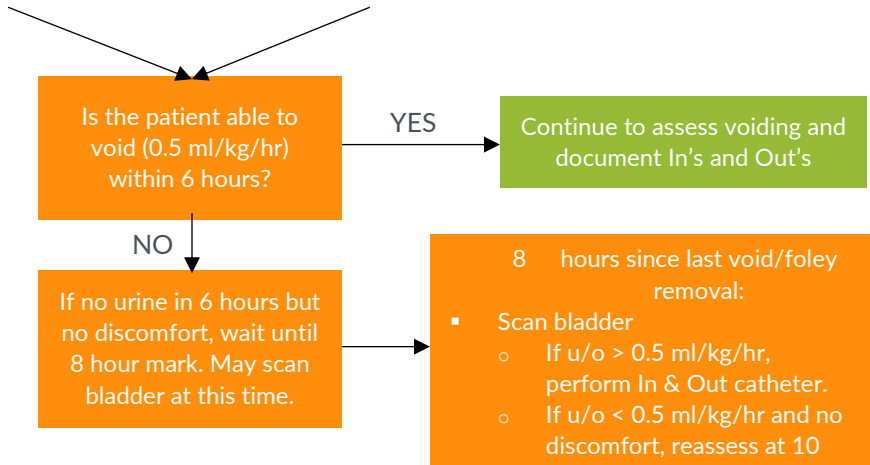
MAINTENANCE BUNDLE

Prevention Bundle Element-Maintenance	Care Descriptions
Maintain closed drainage system	<ul style="list-style-type: none"> If breaks in aseptic technique, disconnection, or leakage occur, replace the catheter and collecting system using aseptic technique and sterile equipment
Maintain Hygiene	<ul style="list-style-type: none"> Perform perineal hygiene at minimum daily
Keep bag below level of bladder	<ul style="list-style-type: none"> Keep the collecting bag below the level of the bladder at all times. Do not rest bag on the floor
Maintain unobstructed flow of urine	<ul style="list-style-type: none"> Keep the catheter and collecting tube free from kinking.
Remove catheter when no longer needed	<ul style="list-style-type: none"> Review necessity daily If physician order in place on SCM to follow "nurse driven protocol", then daily assessment and removal as soon as criteria met.
Secure catheter	

*SPS / CDC Reference

NURSE DRIVEN PROTOCOL





Criteria for Use of Urinary Catheter:

- Physician order for the Nurse Driven Protocol in SCM.
- Hemodynamic instability requiring close monitoring of u/o (shock, low CO, oliguria/polyuria, hypo/hyponatremia)
- Immobilization due to the following:
 - Surgical procedure (pelvic/hip fracture).
 - Unstable spine fracture or precautions.
 - Acute brain injury.
 - Chemically paralyzed or sedated*
- Pre-operative/post-operative order according to surgeon:
 - 24-48 hrs post-op in most patients.
 - Urologic/perineal procedures, therefore catheterization determined by Urologist.
- Epidural in place.
- Bladder irrigation required (chemotherapy, blood clots, etc.)
- Patients with “critical foley” inserted by Urologist.
- Burn greater than 20% BSA.
- Acute kidney injury.
- End of Life comfort.
- Skin breakdown in sacral/groin region or stage III/IV unsurgical pressure ulcer to sacrum/perineum.
- Urinary Retention that has required 2 in and out catheterizations:
 - Bladder scan > 0.5 ml/kg/hr

*Chemical paralysis and sedation only if patient proven to have urinary retention.

**If catheterized because of inability to void, discuss trial of removal of catheter with physician followed by an assessment using the “inability to void algorithm”^{12 13}

APPENDIX A

Criteria for Use of Urinary Catheter

- Physician order for the nurse driven protocol.
- Hemodynamically instability requiring close monitoring of u/o (shock, low CO, oliguria/polyuria, hypo/hyponatremia).
- Urinary Retention:
 - Bladder scan with > 100ml - 300 ml
- Immobilization due to the following:
 - Surgical procedure (pelvic/hip fracture) necessitating immobilization
 - Sedation/paralysis/decreased LOC
 - Unstable spine fracture or precautions
 - Acute head injury
 - Chemically paralyzed or sedated*
- Skin breakdown in sacral/groin region or Stage III/IV/unstageable pressure ulcer to sacrum/perineum.
- Preoperative/postoperative order according to surgeon:

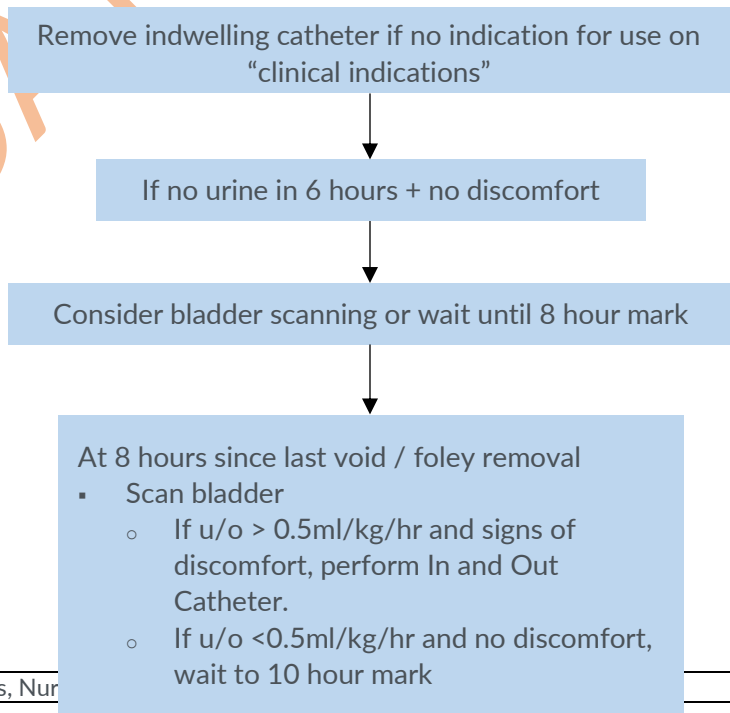
- 24 hours post-op in most patients
- Urologic/perineal procedures therefore catheterization determined by urologist
- Epidural place
- Bladder irrigation required (for chemotherapy, blood clots)
- End of life comfort care
- Patients with “critical foley” inserted by urologist
- Burn greater than 20% BSA
- Acute Kidney Injury

*Chemical paralysis and sedation only if patient has proven to have urinary retention on medications.

**If catheterized because of inability to void, discuss trial of removal of catheter with physician followed by an assessment using the “inability to void algorithm”.

APPENDIX B

Assessment of Protocol for Failure to Void Situation



Repeat process in 8 hours if no urine output

*Consider indwelling vs. In and Out

Alternatives to using Indwelling Foley Catheter^{14 1}

Consider using alternatives to indwelling urethral catheterization in select patients

- Consider using external catheters as an alternative to indwelling urethral catheters in cooperative male patients without urinary retention or bladder outlet obstruction.
- Consider alternatives to chronic indwelling catheters, such as intermittent catheterization, in spinal cord injury patients.
- Intermittent catheterization is preferable to indwelling urethral or suprapubic catheters in patients with bladder emptying dysfunction
- Consider intermittent catheterization in children with myelomeningocele and neurogenic bladder to reduce the risk of urinary tract deterioration.

REFERENCES

¹ [Guideline for prevention of catheter-associated urinary tract infections 2009](#). Gould CV, Umscheid CA, Agarwal RK et al. Healthcare Infection Control Practices Advisory Committee.

² [Implementation of a Nurse-Driven Protocol for Catheter Removal to Decrease Catheter-Associated Urinary Tract Infection Rate in a Surgical Trauma ICU](#). Tyson AF, Campbell EF, Spangler LR, Ross SW, Reinke CE, Passaretti CL, Sing RF. J Intensive Care Med. 2018 Jan 1:885066618781304.

³ [Children's Hospital Solutions for Patient Safety](#).

⁴ [Catheter-Associated Urinary Tract Infections \(CAUTI\): SPS Prevention Bundle](#).

⁵ [Urinary tract infection \(catheter-associated urinary tract infection \[CAUTI\] and non-catheter-associated urinary tract infection \[UTI\] and other urinary system infection \[USI\]\) events](#). Center of Disease Control, Jan 2017.

⁶ [Reduction in catheter-associated urinary tract infections by bundling interventions](#). Clarke K, Tong D, Pan Y, Easley KA, Norrick B, Ko C, Wang A, Razavi B, Stein J. Int J Qual Health Care. 2013 Feb;25(1):43-9.

⁷ [Strategies to prevent catheter-associated urinary tract infections in acute care hospitals: 2014 update](#). Lo E, Nicolle LE, Coffin SE, Gould C, Maragakis LL, Meddings J, Pegues DA, Pettis AM, Saint S, Yokoe DS. Infect Control Hosp Epidemiol. 2014 May;35(5):464-79.

⁸ [Guide to preventing catheter-associated urinary tract infections](#). Association for Professionals in Infection Control and Epidemiology (2014).

-
- ⁹ [Nurse-directed interventions to reduce catheter-associated urinary tract infections.](#) Oman KS, Makic MB, Fink R, Schraeder N, Hulett T, Keech T, Wald H. Am J Infect Control. 2012 Aug;40(6):548-53.
- ¹⁰ Assessment of/Protocol for Failure to Void. [Rhode Island Hospital Nursing Manual.](#)
- ¹¹ [Implementation of a nurse-driven protocol to prevent catheter-associated urinary tract infections.](#) Alexaitis I, Broome B. J Nurs Care Qual. 2014 Jul-Sep;29(3):245-52.
- ¹² [Evaluation of an evidence-based, nurse-driven checklist to prevent hospital-acquired catheter-associated urinary tract infections in intensive care units.](#) Fuchs MA, Sexton DJ, Thornlow DK, Champagne MT. J Nurs Care Qual. 2011 Apr-Jun;26(2):101-9.
- ¹³ [Successful reduction in catheter-associated urinary tract infections: focus on nurse-directed catheter removal.](#) Parry MF, Grant B, Sestovic M. Am J Infect Control. 2013 Dec;41(12):1178-81.
- ¹⁴ [Children's National Medical Center Division of Nursing & Patient Services. Nursing Practice Guideline \(2012\)](#)

UPDATE IN PROGRESS