PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

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BEST PRACTICES
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Prevention of Catheter-Associated Urinary Tract Infections

Prevention and Treatment of Venous Thromboembolism

Prevention of Catheter-Related Bloodstream Infections

Prevention of Surgical Site Infections
PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

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Abstract

Indwelling urinary catheters are a leading cause of nosocomial infection in medical and surgical patients in the United States. Risk assessment, adherence to key preventative strategies, and active surveillance can reduce rates of symptomatic catheter-associated urinary tract infections (CAUTIs). The purpose of this document is to review the current literature, consolidate recommendations from existing guidelines, and provide a concise, evidence-based, expert panel-rated list of interventions to help reduce CAUTIs among surgical patients at your institution.

Background

More than five percent of Medicare patients in 2005 were diagnosed with postoperative urinary infections.1 Urinary tract infections represent 32 to 40 percent of all nosocomial infections, which occur in up to 1.7 million patients annually.2,3 As many as 80 percent of urinary tract infections are attributable to urinary catheterization.1 In a recent study of over 36,000 patients undergoing major surgery, 86 percent of these patients had perioperative urinary catheters.4 Of note, patients who had indwelling catheters for longer than two days postoperatively were twice as likely to develop a CAUTI.

An episode of CAUTI results in direct and indirect costs of $676 and $2,386, respectively.5 Due to the high frequency of catheter use in hospitalized patients, the cumulative economic impact of CAUTIs is significant. Patients who experience CAUTIs require an additional one to 3.8 hospital days. It is estimated that CAUTIs account for $340 to $450 million in additional health
care costs every year.\textsuperscript{6-8} In response, the Centers for Medicare and Medicaid Services no longer provides reimbursement to providers of covered beneficiaries for the treatment of CAUTIs.\textsuperscript{9} In addition, the Surgical Care Improvement Project UTI measure (SCIP Inf-9) requires providers to submit data on the proportion of the sample of surgical patients captured for which a urinary catheter (if used) was removed on postoperative day one or two.\textsuperscript{9}

### Risk Factors for CAUTIs

Risk factors for developing CAUTIs have been identified (Table 1). While insertion of a urinary catheter is essential for developing a CAUTI, duration of catheterization is the most important risk factor (additional risk factors are shown in Table 1). As such, the best way to avoid CAUTIs is to avoid unnecessary catheterization and remove bladder catheters as soon as possible.\textsuperscript{10}

<table>
<thead>
<tr>
<th>Major Risk Factors</th>
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<tbody>
<tr>
<td>Increasing duration of catheterization</td>
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<tr>
<td>Female sex</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
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<tr>
<td>Faulty aseptic management of indwelling catheter</td>
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<tr>
<td>Bacterial colonization of drainage bag</td>
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<table>
<thead>
<tr>
<th>Additional Risk Factors</th>
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<tbody>
<tr>
<td>Older age</td>
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<tr>
<td>Azotemia</td>
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<tr>
<td>Rapidly fatal underlying illness</td>
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<tr>
<td>Periurethral colonization with uropathogens</td>
</tr>
<tr>
<td>Catheter not connected to urine meter</td>
</tr>
</tbody>
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\textsuperscript{6}\textsuperscript{8}

\textsuperscript{9}\textsuperscript{10}
Studies suggest that more than 50 percent of catheterizations in hospitalized patients may be unnecessary.\textsuperscript{12-16} The indications for indwelling bladder catheterization are limited, based predominately on expert or consensus opinion, and commonly include:\textsuperscript{9,17}

- Perioperative use for selected surgical procedures (with planned removal as soon as possible)\textsuperscript{17-21}
  - Patients undergoing urologic surgery (or other surgery on contiguous structures of the genitourinary tract)
  - Anticipated prolonged duration of surgery (catheters inserted for this reason should ideally be removed in the postanesthesia care unit)
  - Patients anticipated to receive large-volume infusions or diuretics during surgery
  - Operative patients with urinary incontinence
- Need for intraoperative monitoring of urinary output
- Need for short-term, frequent monitoring of urine output in critically ill patients
- Management of acute urinary retention/obstruction
- Need to facilitate healing of advanced pressure ulcers in incontinent patients when other interventions (for example, condom catheters, wound dressings) are ineffective
- Use at patient request to improve comfort (for example, terminally ill patients)

Indwelling catheters should \textit{NOT} be used:

- As a substitute for nursing care of the patient or resident with incontinence
- As a means of obtaining urine for culture (or other diagnostic tests) when the patient can voluntarily void
- Routinely for patients receiving epidural anesthesia/analgesia
Basic Strategies to Prevent CAUTIs

Certain measures during the insertion and maintenance of a urinary catheter can help prevent against associated infection (Table 2).

**TABLE 2: BASIC RECOMMENDATIONS FOR PREVENTION OF CAUTIs**17, 22-24

<table>
<thead>
<tr>
<th>Prior to Insertion of Urinary Catheter</th>
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<tbody>
<tr>
<td>Use alternate bladder drainage methods (for example, condom catheters, in-and-out catheterization) when appropriate.25-31</td>
</tr>
<tr>
<td>Educate staff regarding proper insertion and maintenance of urinary catheters.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>During Insertion of Urinary Catheter</th>
</tr>
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<tbody>
<tr>
<td>Ensure that only trained personnel insert urinary catheters.11,32-34</td>
</tr>
<tr>
<td>Practice hand hygiene immediately prior to insertion of catheter.35,36</td>
</tr>
<tr>
<td>Use standard precautions (including use of gown and gloves, as appropriate) prior to any manipulation of the catheter/drainage system.</td>
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</table>

<table>
<thead>
<tr>
<th>After Insertion of Urinary Catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Properly secure to prevent movement/urethral traction.37</td>
</tr>
<tr>
<td>Maintain sterile, closed drainage system.34,38-41</td>
</tr>
<tr>
<td>Position drainage bag below bladder and off floor.42</td>
</tr>
<tr>
<td>Perform routine, daily meatal care (use of antiseptics is NOT necessary).43-45</td>
</tr>
<tr>
<td>Practice hand hygiene and wear clean gloves prior to any manipulation of the catheter/drainage system.35,36</td>
</tr>
<tr>
<td>Obtain urine sample aseptically from sampling port.23,34</td>
</tr>
<tr>
<td>Avoid routine catheter irrigation. If obstruction is anticipated, closed continuous irrigation may be used. To relieve obstruction due to mucus or clots, an intermittent method may be used.46-48</td>
</tr>
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</table>

Education of patients and caretakers via “fact sheets” (Appendix A) or nurse-directed education, competency-based training, or skills labs may help reinforce appropriate provider adherence and self-protective behaviors consistent with many of the recommendations cited above (for example, keeping the urinary drainage bag secure, unobstructed, and lower than the bladder).49
Special Approaches to Prevent CAUTIs

Additional, special strategies may be needed for use in locations/populations with unacceptably high rates of CAUTIs despite implementation of the basic strategies outlined above (Table 3).

**TABLE 3: SPECIAL APPROACHES FOR PREVENTION OF CAUTIs**

<table>
<thead>
<tr>
<th>Before Insertion of Urinary Catheter</th>
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<tbody>
<tr>
<td>Develop procedure-specific guidelines or criteria to restrict perioperative catheter insertion.50</td>
</tr>
<tr>
<td>Establish mechanism to ensure urinary retention medications resumed postoperatively (for example, alpha blockers).51</td>
</tr>
<tr>
<td>Develop protocol for management of postoperative urinary retention (for example, nurse-directed use of bladder scanners, in-and-out catheterization, and so on).52</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>During Insertion of Urinary Catheter</th>
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</thead>
<tbody>
<tr>
<td>Consider use of antimicrobial-coated catheters for selected, high-risk patients (for example, patients undergoing certain urologic procedures or requiring prolonged [&gt;7–10 days] bladder catheterization).53-58</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>After Insertion of Urinary Catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement unit-/institution-wide protocol to identify and remove unnecessary bladder catheters.10,15,59-63</td>
</tr>
</tbody>
</table>
Several of the basic and special approaches outlined in Tables 1, 2, and 3 can be implemented unit- or institution-wide as a “bladder bundle” that uses the mnemonic ABCDE:\(^6^4,^6^5\)

- **Adherence to generally recommended infection control principles** (for example, hand hygiene, aseptic insertion, proper maintenance).
- **Bladder ultrasound** may avoid indwelling catheterization.
- **Condom and intermittent catheterization** in appropriate patients.
- **Do not use** the indwelling catheter unless you must.
- **Early removal** of the catheter using reminders or stop orders.

Identification and removal of unnecessary bladder catheters should be a priority.

Unit- and institution-wide protocols to identify and remove unnecessary bladder catheters should be implemented, including:

- **Procedure-specific guidelines** for postoperative catheter removal.\(^5^0\)
- **Institutional policies** requiring daily reassessment of need for continued catheterization.
- **Daily, physician reminders** (in chart, electronic, or nurse-generated form) to alert providers that an indwelling catheter is still in place and that its continued use should be reassessed (Appendix B).\(^1^0,^3^6,^5^0,^6^3,^6^6\)
- **Automatic stop orders** requiring renewal of the indwelling bladder catheter.\(^6^7\)
- **Daily ward rounds** by nurses/physicians to review patients with bladder catheters and determine continuing necessity.\(^1^5,^6^1,^6^8\)
Approaches that Should NOT Be Considered for the Prevention of CAUTIs

### TABLE 4: APPROACHES NOT RECOMMENDED FOR PREVENTION OF CAUTIs\(^{17,22-24}\)

**During Insertion of Urinary Catheter**

- Do not use silver-coated or antibiotic-impregnated catheters routinely.\(^{17,54,56}\)

**After Insertion of Urinary Catheter**

- Do not add antibiotics to drainage bag.\(^{69,70}\)
- Do not use systemic antibiotic prophylaxis.\(^{71}\)
- Do not change catheters or drainage bags routinely.\(^{72-75}\)
- Do not screen for or treat asymptomatic bacteriuria in catheterized patients.\(^{9,11,76}\)

### Surveillance

Standardized criteria should be used to identify patients with asymptomatic bacteriuria versus symptomatic UTIs (Appendix C).\(^{9,77}\) Use of uniform definitions by providers, infection control personnel, and data abstractors will ensure that the numerators used are reliable when discussing CAUTI rates.

Patients at high risk for developing CAUTIs should be identified and followed closely. Adherence to the basic prevention guidelines cited above should be tracked, and CAUTI rates should be closely monitored using a program such as the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) or other hospital-based, internal data collection program. Documenting indications for use and cases where basic prevention recommendations are not used is encouraged to guide and focus ongoing quality improvement efforts.

Because asymptomatic bacteriuria does not present an increased risk for CAUTIs unless other factors are present (and its treatment can lead to antibiotic-associated disease and resistance), routine screening for and treatment of bacteriuria in catheterized patients is NOT recommended.\(^{9,76,77}\) In lieu of participation in
the ACS NSQIP, surveillance programs that monitor urine culture results through the microbiology lab can be used to identify patients with potential symptomatic urinary tract infections. Patients with positive urine cultures can then be assessed for the presence of an indwelling bladder catheter and possible CAUTI based on defined surveillance criteria. The purpose of these surveillance programs should be to monitor rates of possible CAUTI in order to help guide, implement, and evaluate quality-improvement programs while providing critical performance feedback.

Summary

CAUTIs are a leading source of morbidity and increased length of stay and costs in hospitalized, postoperative patients. The best way to avoid CAUTIs is to avoid unnecessary catheterization and remove catheters as soon as possible. Adherence to generally accepted infection control principles, application of the basic and special recommendations contained in this document, and active surveillance can help guide quality improvement efforts and reduce CAUTI rates at your institution.
Appendix A: Catheter-Associated Urinary Tract Infections Patient Education Sheet
Appendix B: Sample Urinary Catheter Provider Reminder

**URINARY CATHETER REMINDER**

**DATE: ___/___/___**

This patient has had an indwelling urethral catheter since ___/___/___

Please indicate below EITHER (1) that the catheter should be removed OR (2) that the catheter should be retained. If the catheter should be retained, please state ALL of the reasons that apply.

- Please **discontinue** indwelling urethral catheter; OR

- Please **continue** indwelling urethral catheter because patient requires indwelling catheterization for the following reasons (please check **all** that apply):
  - Urinary retention
  - Very close monitoring of urine output and patient unable to use urinal or bedpan
  - Open wound in sacral or perineal area and patient has urinary incontinence
  - Patient too ill or fatigued to use any other type or urinary collection strategy
  - Patient had recent surgery
  - Management of urinary incontinence on patient’s request
  - Other—please specify
Appendix C: Clinical and Surveillance Definitions of Asymptomatic Bacteriuria and Urinary Tract Infections

Clinical Definitions of Asymptomatic Bacteriuria

Isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen in a manner that minimizes contamination

For women: two consecutive voided specimens with isolation of the same bacterial strain in quantitative counts ≥100,000 CFU/mL or a single catheterized urine specimen with one bacterial species isolated in a quantitative count >100 CFU/mL

For men: a single, clean-catch voided urine specimen with one bacterial species isolated and quantitative count ≥100,000 CFU/mL or a single catheterized urine specimen with one bacterial species isolated and quantitative count >100 CFU/mL

and the absence of signs and symptoms that may suggest urinary tract infection, such as:

- Fever
- Urgency
- Frequency
- Dysuria
- Suprapubic tenderness
- Costovertebral angle pain/tenderness

Centers for Disease Control and Prevention National Healthcare Safety Network Surveillance Criteria for Symptomatic Urinary Tract Infections

Urinary tract infections (UTI) are defined using symptomatic urinary tract infection (SUTI) criteria or asymptomatic bacteremic UTI (ABUTI) criteria (Table 5). Report UTIs that are catheter-associated (for example, patient had an indwelling urinary catheter at the time of or within 48 hours before onset of the event). There is no minimum period of time that the catheter must be in place in order for the UTI to be considered catheter associated.
Appendix C (cont’d)

**NOTE:** SUTI 1b and 2b and other UTI (OUTI) cannot be catheter associated.

**EXAMPLE:** A patient on an inpatient unit has a Foley catheter in place. It is discontinued, and four days later the patient meets the criteria for a UTI. This UTI is not reported as a CAUTI because the time since Foley discontinuation exceeds 48 hours.

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### TABLE 5: URINARY TRACT INFECTION CRITERIA

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Symptomatic Urinary Tract Infection (SUTI) Must meet at least 1 of the following criteria:</th>
</tr>
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<tbody>
<tr>
<td>1a</td>
<td>Patient had an indwelling urinary catheter in place at the time of specimen collection and at least 1 of the following signs or symptoms with no other recognized cause: fever (&gt;38°C), suprapubic tenderness or costovertebral angle pain or tenderness and a positive urine culture of $\geq 10^5$ colony-forming units (CFU) /ml with no more than 2 species of microorganisms. OR</td>
</tr>
<tr>
<td></td>
<td>Patient had an indwelling urinary catheter removed within the 48 hours prior to specimen collection and at least 1 of the following signs or symptoms with no other recognized cause: fever (&gt;38°C), urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness and a positive urine culture of $\geq 10^5$ colony-forming units (CFU) /ml with no more than 2 species of microorganisms.</td>
</tr>
<tr>
<td>1b</td>
<td>Patient did not have an indwelling urinary catheter in place at the time of specimen collection within 48 hours prior to specimen collection and has at least 1 of the following signs or symptoms with no other recognized cause: fever (&gt;38°C) in a patient that is &gt;65 years of age, urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness and a positive urine culture of $\geq 10^5$ CFU/ml with no more than 2 species of microorganisms.</td>
</tr>
<tr>
<td>2a</td>
<td>Patient had an indwelling urinary catheter in place at the time of specimen collection and at least 1 of the following signs or symptoms with no other recognized cause: fever (&gt;38°C), suprapubic tenderness, or costovertebral angle pain or tenderness and a positive urinalysis demonstrated by at least 1 of the following findings: a. positive dipstick for leukocyte esterase and nitrite b. pyuria (urine specimen with $\geq 10^5$ white blood cells [WBC] /μl or $\geq 3$ WBC high power field of urinum urine) c. microorganisms seen on Gram stain of urinum urine and a positive urinalysis demonstrated by at least 1 of the following findings: a. positive dipstick for leukocyte esterase and nitrite b. pyuria (urine specimen with $\geq 10^5$ white blood cells [WBC] /μl or $\geq 3$ WBC high power field of urinum urine) OR</td>
</tr>
<tr>
<td></td>
<td>Patient had an indwelling urinary catheter removed within the 48 hours prior to specimen collection and at least 1 of the following signs or symptoms with no other recognized cause: fever (&gt;38°C), urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness and a positive urinalysis demonstrated by at least 1 of the following findings: a. positive dipstick for leukocyte esterase and nitrite b. pyuria (urine specimen with $\geq 10^5$ white blood cells [WBC] /μl or $\geq 3$ WBC high power field of urinum urine) OR</td>
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### TABLE 5 (cont’d)

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Asymptomatic Bacteriemic Urinary Tract Infection (ABUT)</th>
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<tbody>
<tr>
<td>Patient with or without an indwelling urinary catheter has no signs or symptoms (i.e., no fever (&gt;38°C) for patients ≥65 years of age, and for any age patient no urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness. OR for a patient ≤1 year of age, no fever (&gt;38°C core), hypothermia (&lt;36°C core), apnea, bradycardia, dysuria, lethargy, or vomiting) and a positive urine culture of ≥10^5 CFU/ml with no more than 2 species of uropathogenic microorganisms** and a positive blood culture with at least 1 matching uropathogenic microorganism to the urine culture.</td>
<td></td>
</tr>
</tbody>
</table>

*Fever is not diagnostic for UTI in the elderly (≥65 years of age) and therefore fever in this age group does not disqualify from meeting the criteria of an ABUT.

**Uropathogenic microorganisms are: Gram-negative bacilli, Staphylococcus spp., Escherichia coli, Enterococcus spp., G. vaginalis, Enterococcus urinaceus, and Corynebacterium (urease positive).
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